Apple® II

Apple IIe Owner's Guide



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Apple II

Apple IIe Owner's Guide



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Preface

Welcome to a wonderful adventure—learning how to use and enjoy your Apple® IIe computer. The adventure begins here—getting an overview of this book and other learning materials that come with your computer.

Learning about the Apple IIe

Your Apple IIe package contains two books and two disks. This book, the *Apple IIe Owner's Guide,* contains everything you need for a good start—from setting up the computer to a list of resources. Here's an overview of the book:

Chapter 1, "Setting Up the Apple IIe," shows you how to plug in the computer, attach peripheral devices, and connect the monitor.

Chapter 2, "Starting the Apple IIe," shows you how to start the computer, work with disks, and interact with the computer through the keyboard.

Chapter 3, "More About Disks," goes into more detail on disks—how they work, how to handle and store them, and how to protect the information you've saved on them.

Chapter 4, "The Inside Story," gives you a brief look at how your computer and disks work together.

Chapter 5, "Software," introduces the many kinds of programs available.

Chapter 6, "Peripheral Devices," catalogs hardware you can install to complement your system.

Chapter 7, "Resources," offers suggestions on where you can turn for more information on the Apple IIe, software, and hardware.

Appendix A, "Ask Apple," presents frequently asked questions and their answers.

Appendix B, "Guide to Service and Support," explains programs that Apple Computer, Inc. has set up to ensure your computer a long, productive life.

Appendix C, "Troubleshooting," includes troubleshooting tips and techniques for solving common computer problems.

Appendix D, "Specifications," gives basic technical data.

Appendix E, "Apple II Family Differences," describes the differences between the members of the Apple II family of computers.

Appendix F, "Extended 80-Column Text Card," describes how to turn the card off and on in order to switch between 40- and 80-column displays using the keyboard or from a BASIC or Pascal program.

The Glossary lists common computer terms and their definitions.

The second book, *A Touch of Applesoft BASIC,* teaches programming in the BASIC language. You don't have to program to use the Apple IIe; however, many people find programming a productive and enjoyable pastime.

A third book, *System Utilities,* comes in the Apple IIe Utilities Kit with each disk drive. It discusses ProDOS® commands and how to use the *System Utilities* disk (also part of the kit).

What to read

If you're an experienced user—that is, you already know how to work with an Apple II and ProDOS—just read Chapter 1 to set up. If you're unfamiliar with ProDOS, also read Chapter 3 and *System Utilities*.

If you're a beginner, reading Chapters 1 through 3 will give you all the basics for working with your new Apple IIe. Chapters 4 through 7 contain helpful information you can read at your leisure. Read the appendixes as you need them.

Learning by doing

Your Apple IIe package includes two tutorial disks. Each disk contains two interactive tutorials, one on each side of each disk.

- *Apple Presents the IIe: An Introduction* teaches you how to use the keyboard to enter text and control the computer.
- *Apple Presents the IIe: The Inside Story* explains how the computer and disks work together.
- *Apple Presents the IIe: The Apple at Work* contains three popular applications: a word processor, a spreadsheet, and a data base.
- *Apple Presents the IIe: Getting Down to BASIC* introduces you to programming in the BASIC language.

With these disks, you can learn about the Apple IIe by interacting with the computer—not just by reading or by experimenting on an important project.

Visual cues

Look for these special notes throughout the manual:

❖ *By the way:* Text set off in this manner presents sidelights or interesting pieces of information.

Important Text set off in this manner—and with a tag in the margin—presents important information.

Warning Warning boxes like this indicate a situation that could harm your computer or software.

Definitions of terms and references to other parts of the book appear in the margin.

Boldface type indicates the introduction of computer terminology. Boldfaced terms are defined in the Glossary. Sometimes additional information about the term appears in the margin.

A special typeface indicates characters you should type or that you see on the screen:

```
It looks like this.
```

With the exception of ⌘, this book spells out key names; for example, the Return key and the Left Arrow key. The symbol ⌘ stands for the Apple key (to the left of the space bar).

When you see a hyphen joining two or more keys, press the first key and hold it down while pressing the second key. For instance, Control-Reset tells you to press Control and hold it down while you press the Reset key.

Radio and television interference

The equipment described in this manual generates and uses radio-frequency energy. If it is not installed and used properly—that is, in strict accordance with our instructions—it may cause interference with radio and television reception.

This equipment has been tested and complies with the limits for a Class B computing device in accordance with the specifications in Subpart J, Part 15, of FCC rules. These rules are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that the interference will not occur in a particular installation, especially if a "rabbit-ear" television antenna is used. (A rabbit-ear antenna is the telescoping-rod type usually found on television receivers.)

You can determine whether your computer is causing interference by turning it off. If the interference stops, it was probably caused by the computer or its peripheral devices. To further isolate the problem, disconnect the peripheral devices and their input/output cables one at a time. If the interference stops, it was caused by either the peripheral device or the I/O cable. These devices usually require shielded I/O cables. For Apple peripherals, you can obtain the proper **shielded cable** from your dealer. For non-Apple peripheral devices, contact the manufacturer or dealer for assistance.

A *shielded cable* has wires wrapped with a metallic foil. The wrap reduces the effects of radio-frequency interference between the cable and other devices.

If your computer does cause interference to radio or television reception, you can try to correct the interference by using one or more of the following measures:

- Turn the television or radio antenna until the interference stops.
- Move the computer to one side or the other of the television or radio.
- Move the computer farther away from the television or radio.
- Plug the computer into an outlet that is on a different circuit than the television or radio. (That is, make certain the computer and the radio or television set are on circuits controlled by different circuit breakers or fuses.)
- Consider installing a rooftop television antenna with a coaxial cable lead-in between the antenna and television.

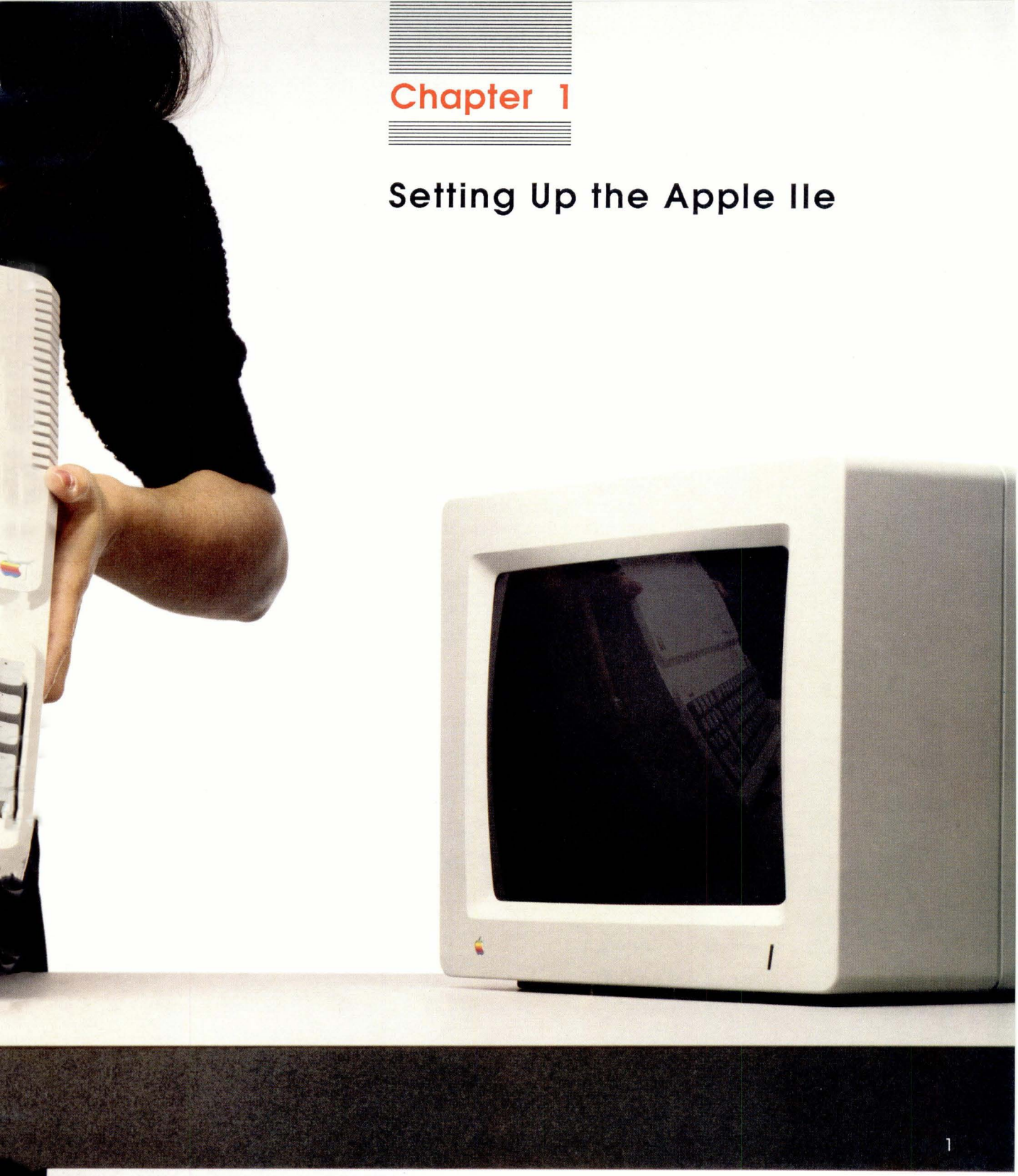
If necessary, consult your authorized Apple dealer or an experienced radio/television technician for additional suggestions.

Important Your Apple computer and its peripheral devices were FCC-certified under test conditions that included use of shielded cables and connectors between system components. It is important that you use shielded cables and connectors to reduce the possibility of causing interference to radio, television, and other electronic devices.


Apple IIe
Apple IIe

Chapter 1

Setting Up the Apple IIe



Setting up your Apple® IIe is the first step toward working with and enjoying your computer. Whether your tasks include a major corporate budget or a letter home, you'll find that the Apple IIe and some good computer programs make work and study easier and more productive. You don't have to wait until you've "mastered" your computer to enjoy it. You can start enjoying it now, as you acquaint yourself with the computer's parts and how they work together.

If you've never used a computer before, don't worry; setup is not difficult. Just follow the step-by-step instructions in this chapter. The chapter shows you how to plug in your Apple IIe and connect the monitor and gives you guidelines for installing **peripheral devices.** Peripheral devices (also called simply *peripherals* or *devices*) include disk drives, printers, modems—any piece of equipment that works directly with a computer. When connected, these elements become a **computer system.** See Figure 1-1.

❖ *Already set up?:* If you've already connected the monitor and peripheral devices to your Apple IIe, you can skip directly to "Day-to-Day Life With the Apple IIe" near the end of this chapter.

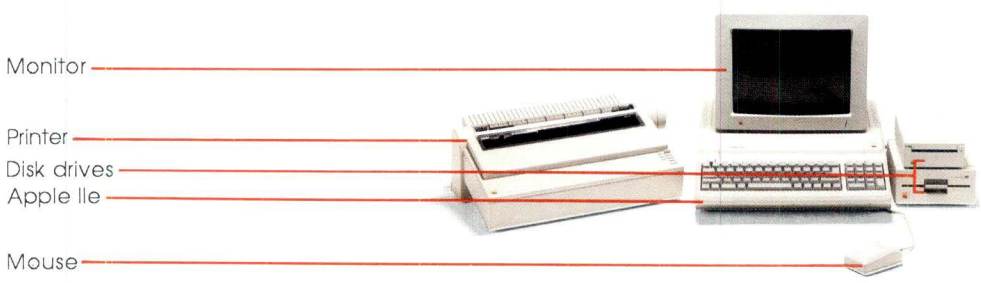


Figure 1-1
An Apple IIe and its peripheral devices

Getting started

If you haven't already done so, unpack your computer and make sure you have

- An Apple IIe
- A power cord
- Two tutorial disks
- The book *A Touch of Applesoft BASIC*
- A warranty card
- A packing list

If you're missing anything, contact your authorized Apple dealer.

Put your warranty card and sales slip together in a safe place. Once you've gone through one or more disk tutorials, please take a moment to fill out the Tell Apple card (inserted in the back of this manual) and mail it in.

Creating a good working environment

Before you assemble your system, look over your working environment. Consider things like lighting, the sturdiness of the work surface (no flimsy tables, please), and availability of electrical outlets.

Most people don't like having a window directly behind them, because the light from the window can reflect on the monitor screen, making the screen difficult to read. Many people like to set their monitors on monitor stands. A stand makes for efficient use of desk space and a comfortable viewing angle.

Never place a computer system where it will be exposed to direct sunlight or any other heat source (like a wall heater) for long periods of time. Long-term exposure can damage a computer.

Avoid laying power cords and cables where people walk. Passers-by can trip, damage cords and cables, and accidentally unplug the system. Also avoid plugging into an outlet that is controlled by a wall switch; someone could accidentally turn off the lights and your computer. (Any work not saved on disk disappears when you turn the power off.)

Many people prefer to plug the computer and peripheral devices into a **power strip.** A power strip has multiple outlets and, often, its own on/off switch. Deluxe power strips include a **surge protector** to protect your system from severe voltage increases. See your authorized Apple dealer for accessories like computer fans, power strips, and surge protectors.

Choose a position for your printer from which paper can move freely into and out of the machine. Installing a modem? If so, position the computer so that you can easily connect the modem cable to the telephone and telephone jack.

Finally, always observe safety precautions when setting up and using a computer system.

A strategy for setting up your system

The instructions for setting up your Apple IIe proceed in this order:

- Plugging in the power cord
- Opening the Apple IIe
- Connecting peripheral devices, including disk drives, printer, modem, mouse, and others
- Closing the Apple IIe
- Connecting a monitor or television set.

This order provides maximum safety and ease of access when handling cables and **interface cards.**

An *interface card* is a circuit board that handles communications between a computer and one of the computer's peripheral devices (a printer, for example). Interface cards fit into *slots*, connectors inside the computer.

Software is a set of instructions that tells the computer to do certain things, like start a disk drive, turn the computer into a word processor, or store and retrieve data. **Hardware,** on the other hand, includes the things you can handle—the computer, interface cards, and so forth.

Rather than tell you how to connect each peripheral device, this manual gives you guidelines concerning the handling and installation of interface cards and preferred **slots** for different devices. You should consult the manual for each of your devices for preferred slot assignments and explicit installation instructions. You should also check the manuals that came with the **software** programs you purchased for mentions of necessary slot assignments. Some programs require a particular device to be in a particular slot.

Plugging in the power cord

Before you begin, make sure the Apple IIe's **power switch** is in the off position. The power switch is near the left-rear corner as you face the keyboard.) See Figure 1-2. Plug the power cord into the Apple IIe, as shown in Figure 1-3. Then plug the free end of the power cord into a power outlet.

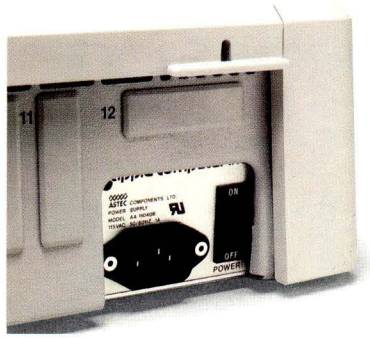


Figure 1-2
Power switch in the off position

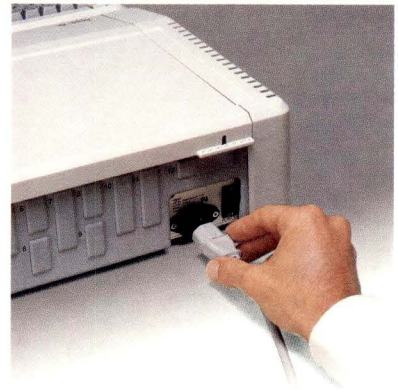


Figure 1-3
Plugging in the power cord

Important

This equipment is intended to be electrically grounded. Your Apple IIe is equipped with a three-wire grounding plug—a plug having a third (grounding) pin. This plug fits only a grounding-type AC outlet. This is a safety feature. If you can't insert the plug into the outlet, get a grounded three-prong adaptor and install it correctly. Or contact a licensed electrician to replace the outlet with a properly grounded outlet. **Do not defeat the purpose of the grounding plug!**

For your own safety and the safety of your equipment, always unplug the Apple IIe as a precaution

- If the power cord or plug is frayed or otherwise damaged
- If you spill anything into the case
- If your Apple IIe is exposed to rain or any other excess moisture
- If you drop the computer or damage the case
- If you suspect that your computer needs servicing or repair
- Whenever you clean the case (see cleaning instructions in "Day-to-Day Life With the Apple IIe").

Opening the Apple IIe

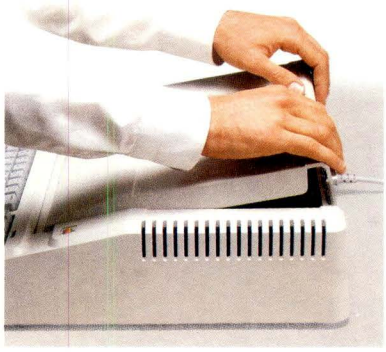


Figure 1-4
Removing the Apple IIe top

Always make sure the computer is switched off and plugged into a power outlet before you remove the top. To remove the top, wrap your fingers under the tabs that project from the back of the computer's top and pull up until the fasteners pop. Slide the top toward the back of the computer; then lift it off and set it aside. (See Figure 1-4.)

Once the top is off, you can see the Apple IIe's **main logic board** (also known just as the *board*) shown in Figure 1-5. The main logic board is the piece of fiberglass that serves as a platform for the board's components—the **chips** (the small, black blocks), the lines or **traces** connecting the components, the power supply (the large metal box on the left) and the **slots** for interface cards. The slots are numbered from 1 to 7, from left to right. The board also contains a slot labeled **AUX. CONNECTOR** (for *auxiliary connector*), located toward the front of the main circuit board. This slot should already contain the Extended 80-Column Text Card.

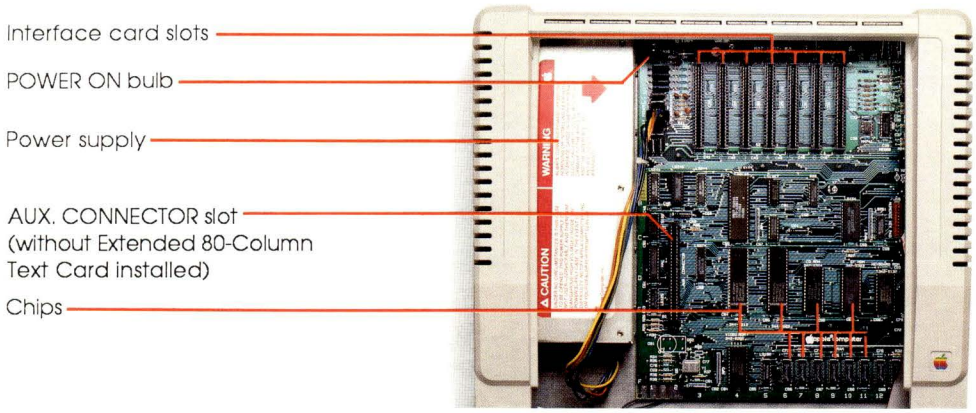


Figure 1-5
The Apple IIe main logic board

Connecting peripheral devices

Computers and peripheral devices communicate information in specific patterns. To translate these patterns between a computer and a device, you need a translator—an **interface card** (also called a *peripheral card*, or just *card*). This section introduces you to interface cards and shows you how to install them and the devices they connect to the computer.

The care and handling of interface cards

An interface card is a small circuit board that fits into one of the slots on the Apple IIe's own circuit board. Some interface cards are general purpose; they can connect different devices (a printer or modem) to the computer. Other cards connect only a specific device; for example, a **disk controller card** connects a specific disk drive to the computer.

Keep these guidelines in mind when you work with interface cards:

- Make sure the tiny bulb labeled *POWER ON* to the left of slot 1 is off. (See Figure 1-5.) If it's on, switch the computer off and wait a few seconds. Never install or remove a card when the power is on. Doing so can damage the card and the computer.
- Before touching a card or any of the computer's internal parts, always discharge any static electricity you might have accumulated by touching the computer's power supply or any grounded metal object.
- Always remove any packing material wrapped around an interface card. Packing material left on a card can cause a card to overheat, damaging the card.
- Always handle a card by its edges and avoid touching the card's components. Static electricity can harm these components.
- Avoid touching the "gold fingers" on a card's **edge connector.** The natural oils on your fingertips can interfere with a good connection.
- Always install a card with the bare side facing the power supply.
- When installing a card, rock it from front to back. Never try to jam the card straight down into its slot or wiggle it from side to side.

Installing an RGB card for an RGB monitor

With the computer top off, you should see an Extended 80-Column Text Card already in the AUX. CONNECTOR slot; this card was installed at the factory. The Apple IIe normally displays a line width of 40 columns (or characters). The Extended 80-Column Text Card boosts this number to 80 columns, so that the computer can display more characters on a line. It also adds 64 **kilobytes** of memory to the 64 kilobytes already on the main circuit board. (Appendix F shows you how to switch back and forth between 40-column and 80-column screen widths.)

A **byte** is a unit of memory equaling one character. A **kilobyte** is 1024 bytes. *Kilobyte* is often abbreviated as *K*, as in "64K." Note that 64K is really 65,536 bytes (64 x 1024).

RGB stands for **R**ed, **G**reen, **B**lue. An *RGB card* translates the computer's video signal for RGB monitors. RGB monitors give a sharper picture and more brilliant color than ordinary monitors (called **composite monitors**).

If you have purchased an **RGB** color monitor, you'll need to remove the Extended 80-Column Text Card. The **RGB card** for the RGB color monitor takes the AUX. CONNECTOR slot instead.

Follow these five steps to install the RGB card:

1. Check to see that the POWER ON bulb is off; then touch the power supply case to discharge any static electricity on your fingertips.

2. Remove the Extended 80-Column Text Card from the AUX. CONNECTOR slot by gripping it firmly along the top edge and rocking it upward. (See Figure 1-6.) Don't wiggle the card from side to side; you might damage the card or the connectors.
3. Remove the wrapper from the RGB card.
4. Hold the card with its bare side facing toward the power supply and press the gold fingers into the AUX. CONNECTOR slot at a slight angle.
5. Gently rock the card from back to front until you've seated it level in the slot. Again, don't wiggle the card from side to side.

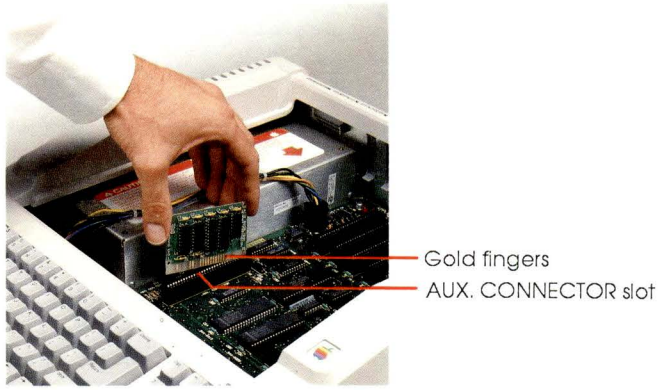


Figure 1-6
Removing the Extended 80-Column Text Card

Store the Extended 80-Column Text Card carefully. A sturdy box with foam padding makes a good container.

Follow the same basic procedure to remove or install other interface cards in slots 1 through 7.

Slots and devices

The purpose of this section is to help you determine which interface cards go in which slots. Some devices don't work when connected to a wrong slot. Begin by determining the position for your disk drive controller card(s). Once that's done, you can simply check your device manual(s) for recommended slots.

❖ *Conflicting slot assignments?* If, after checking your device manuals, you find you have conflicting slot assignments (two or more cards "belong" in the same slot), contact your authorized Apple dealer for a solution.

As you select slots for your devices, write them in the appropriate spaces in Table 1-1 or on a piece of paper. (Use a pencil, in case you want to rearrange any cards.) Many software programs ask you for device positions by slot. Keep this list handy, until you feel familiar with your setup.

Table 1-1
Interface card slot assignments

Slot	Interface card
1	
2	
3	Usually left empty
4	
5	
6	
7	

Choosing disk drive controller slots

The question of where to put disk drive controller cards (also referred to as *disk controllers* or just *controllers*) can become complex because of the combinations of disk drives and software you can have.

If you have only one disk controller, the choice of a slot is easy. However, if you have two disk controllers, you need to consider which controller you usually want to start from. When you switch the computer on, built-in commands search for a disk in the drive slot with the highest number.

You can connect one drive to the controller card and a second drive of the same kind to the first drive (for example, a 5.25-inch drive to another 5.25-inch drive). This process of connecting one peripheral device to another is called **daisy-chaining.**

Warning Always connect a disk drive to the controller card designed for it. Never try to daisy-chain two different drives (like a 5.25-inch and a 3.5-inch disk drive) from the same controller. Mismatching controllers and drives can damage drives and cards.

Here are guidelines to help you decide where to put your controller card(s). Read through them and find the one that best fits your needs.

- *Older drives:* If you are installing older drives, follow the recommendations in their manuals for slot assignments.

One 5.25-inch or one 3.5-inch disk controller

This is easy. Unless you have a good reason to do otherwise, put the disk controller in slot 6. This is the traditional slot assignment for a single controller card. See Figure 1-7.

Two drives that cannot be daisy-chained

Put the controller for the drive you want to start from in slot 6 and the secondary controller in slot 5. See Figure 1-8.

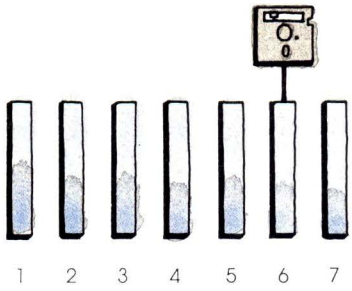


Figure 1-7
Suggested slot
for one controller card

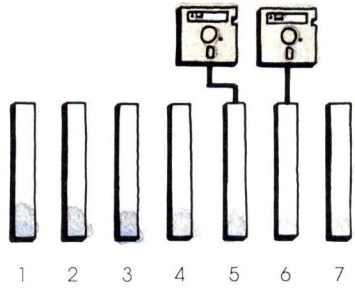


Figure 1-8
Suggested slots
for two controller cards

One 5.25-inch and one 3.5-inch disk controller

Copy-protection schemes: Many software publishing companies set up their disks so that they can't be copied. Some of these methods make it impossible to start a 5.25-inch disk from any slot except 6.

If you plan always to start your computer from the 5.25-inch drive and, for the most part, use your 3.5-inch drive for data storage, put the 5.25-inch disk controller in slot 6 and the 3.5-inch disk controller in slot 5. These positions make your system compatible with all 5.25-inch disk copy-protection schemes and with all programs written in the Pascal programming language. Figure 1-9 illustrates this installation.

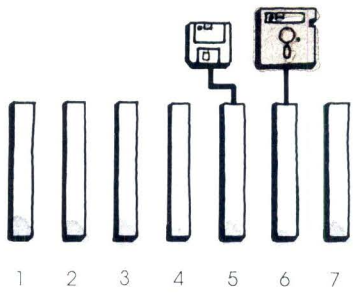


Figure 1-9
Highest compatibility for mixed controller cards

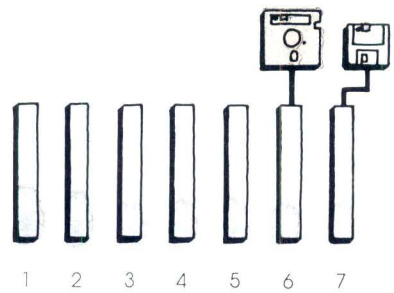


Figure 1-10
Starting from a 3.5-inch disk controller

- *Pascal and slot assignments:* Programs written in Pascal can start only from disk controllers in slots 4, 5, and 6. Likewise, a memory expansion card must also occupy one of these slots for a Pascal program to take advantage of the extra memory. If you have questions about the compatibility of your software and your slot assignments, consult your authorized Apple dealer.

If you want to start from the 3.5-inch disk drive, install the 3.5-inch disk controller in slot 7 and the 5.25-inch disk controller in slot 6. With these slot positions, the computer can start from the 5.25-inch disk when the 3.5-inch drive is empty. Figure 1-10 suggests slot assignments for starting from a 3.5-inch controller.

A hard disk and one other disk drive

Typically, people put the hard disk controller card in slot 5 and the other controller in slot 6. Check your hard disk documentation for suggestions.

Choosing slots for other peripheral devices

This section gives the traditional slot assignments for common peripherals (like printers and modems). Always check the installation instructions that come with each device for recommended slots.

Slot 1

Put your printer interface card in slot 1.

Slot 2

Put your modem card in slot 2.

Slot 3

Unless a device manual specifically instructs you to put a card in slot 3, leave it empty. The card in the AUX. CONNECTOR slot overrides most cards in slot 3.

Slot 4

Slot 4 can take a mouse or a memory expansion card. When you install a mouse, check both the mouse manual and the manuals for the software that work with the mouse. Some software recognizes a mouse only when the mouse is in a particular slot.

If you intend to install a memory expansion card and use software written in Pascal, put your memory expansion card in slot 4. Pascal won't take advantage of the card's extra memory unless it is in slot 4, 5, or 6. Of course, you can put the memory expansion card in slot 5 or 6 if you haven't assigned a disk controller card to either of these slots.

Slots 5, 6, and 7

As you have seen, controller cards can occupy these slots. But with two disk controller cards, either slot 5 or slot 7 remains open. You can assign a mouse to slot 5 or 7, and a co-processor or an AppleTalk™ card to slot 7. Again, consult your device manual(s) for recommendations.

The AUX. CONNECTOR slot

The AUX. CONNECTOR slot is reserved for video and RAM cards, like the Extended 80-Column Text Card. (*AUX.* is an abbreviation for *auxiliary*.) If you buy an RGB color monitor and card, replace the Extended 80-Column Text Card with the RGB card.

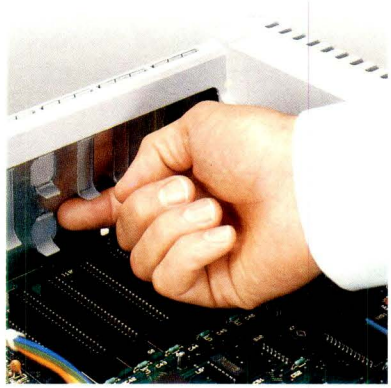
Warning Never place a card designed for slots 1 through 7 in the AUX. CONNECTOR slot. Doing so could damage the card and the slot. The AUX. CONNECTOR slot has a different length than slots 1 through 7.

Installing interface cards

Once you have assigned a slot to each interface card, install the cards, beginning with the highest-numbered slot and working downward. (This order seems to leave the most room when you're installing the last cards.)

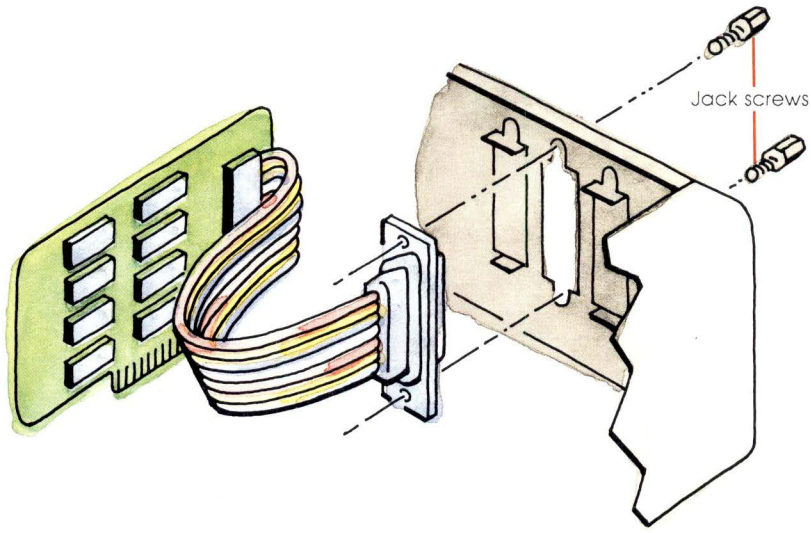
The normal sequence of steps when installing an interface card is

1. Select the opening of the appropriate size nearest the slot.
2. Reach inside the back panel and press down and out on the little tab that protrudes from the insert.



Removing a plastic insert

3. Install the interface card's socket connector on the opening.



Installing an interface card connector

4. Install the interface card.
5. Connect the peripheral device plug connector to the socket connector.



Plugging the device
into the back panel connector

Important

Your Apple IIe and its peripheral devices were FCC-certified under test conditions that included use of **shielded cables** and connectors between system components. Always use shielded cables and connectors to reduce the possibility of causing interference to radio, television, and other electronic devices.

A *shielded cable* has wires wrapped with a metallic foil. The wrap reduces the effects of radio-frequency interference between the cable and other devices.

The back panel of the Apple IIe has 12 openings, as shown in Figure 1-11.

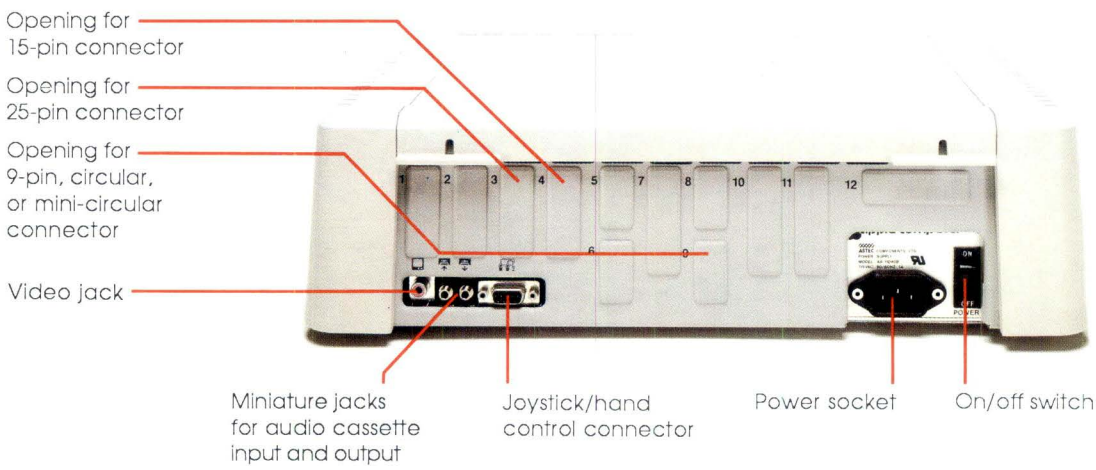


Figure 1-11
Back panel of the Apple IIe

Most interface cards and peripheral devices connect to each other through **D-shaped connectors** at the ends of cables. You attach a D-shaped connector by pressing the plug connector into the socket connector and securing the connection by tightening either two ordinary screws or two thumbscrews.

Important

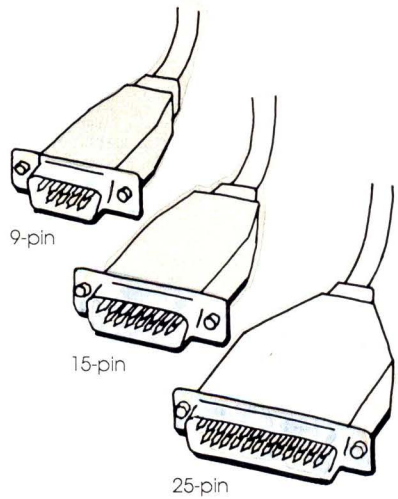
Make sure you always tighten these screws. Otherwise, connectors can work loose and cause the system to stop. A secure connection also helps prevent radio-frequency interference.

Although D-shaped plug connectors contain different numbers of heavy wires, or *pins,* they maintain a similarity—their shape. The top of the connector is wider than the bottom, like the letter D rolled forward. This shape means that you can't plug in the connector incorrectly. When connecting a D-shaped plug to a D-shaped socket, make sure the long and short sides are aligned.

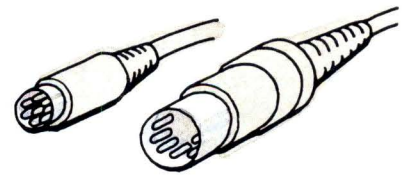
- *How many pins?* The back panel has openings for three different D-shaped connectors: the 9-, 15-, and 25-pin sizes. Sometimes, a D-shaped plug will have fewer pins than its pin capacity. Normally, this is okay. It means that the interface between the two devices doesn't need all the possible channels of information the connector potentially offers.

The two other connectors you might run into are the **circular connector** and the **mini-circular connector.** Although many such connectors have an icon to show which side is face up, it's a good idea to make sure the pins on one connector line up with the holes on the other connector. If you aren't careful, you could bend a pin or force a pin into the wrong opening and damage the connector, the peripheral device, or even the computer.

When you have installed all your interface cards, go ahead and close the computer.



Three sizes of D-shaped connector



Mini-circular connector

Circular connector



Figure 1-12
Replacing the Apple IIe top

Closing the Apple IIe

Put the top in place and press down firmly on the back corners until you hear the fasteners pop shut on both sides. (See Figure 1-12.) With your peripheral devices installed, you can connect the monitor.

Connecting a display device

If you have chosen a monochrome or composite color monitor (not RGB) for your Apple IIe, perform the following three steps. If you plan to connect a television set, see "Connecting to a Television Set."

1. If the monitor power cord is not attached to the monitor, plug the power cord into the monitor. Then plug the other end into a three-hole, grounded outlet (or power strip).
2. Plug either end of the monitor cable into the Apple IIe's video jack—marked by a monitor symbol above it. See Figure 1-13.
3. Plug the other end of the monitor cable into the back of the monitor as shown in Figure 1-14.



Monitor icon

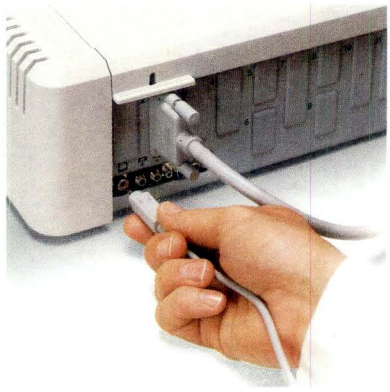


Figure 1-13
Plugging the monitor cable into the computer



Figure 1-14
Plugging the monitor cable into the monitor

❖ *Connecting an RGB (analog) color monitor:* An RGB monitor connects to the Apple IIe through an interface card. See the earlier section "Installing an RGB Card for an RGB Monitor" and your RGB card manual for instructions.

Connecting to a television set

If you plan to connect a television set, you'll probably need a **radio-frequency (RF) modulator** (available from any authorized Apple dealer). An RF modulator modifies signals from the computer so your TV set can display them. RF modulators come with installation instructions.

Before you buy an RF modulator, check the back of your TV set. Newer models may have a two-position switch on the back. One position is for TV, the other for monitor input. The set should also have a jack for connecting a computer. You should be able to connect the computer and the TV set with a standard monitor cable. See the set's manual for details on connecting and switch settings.

Do you have a video cassette recorder (VCR)? Many people have found they can connect the computer to the VCR's "video input" jack with a standard monitor cable and then send the computer's video output through the VCR to the TV set. (Note: Your VCR video input jacks may not match the plug on your monitor cable. You may need an adaptor.)

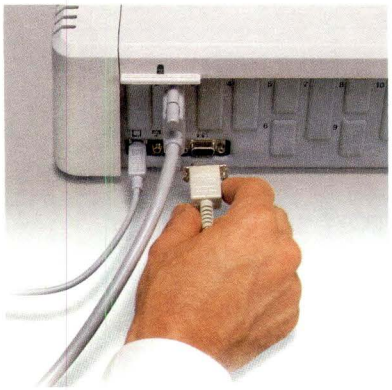


Figure 1-15
Plugging a joystick into the game port

Connecting a joystick or other hand control

If you have a **joystick** or other hand control device (like game paddles), press the device connector into the game port, located just to the right of the video port. Secure the connector by tightening its thumbscrews. See Figure 1-15.

Connecting an audio cassette recorder

To connect an audio cassette recorder, you need a double cable with all four ends terminating in miniature phone plugs. One cable carries data from the computer to the recorder; the other carries data from the recorder to the computer. Most double cables have a different color for each cable (the instructions the follow refer to black and gray cables), so you can tell the input cable from the output cable. See your authorized Apple dealer or local electronics store for such cables. To connect an audio cassette recorder to the Apple IIe, follow these four steps:

1. Insert one plug on the black cable into the MICROPHONE jack on the cassette recorder.
2. Insert the other plug on the black cable into the computer's cassette output jack (marked with an icon that shows an arrow pointing *toward* a cassette).
3. Insert one plug on the gray cable into the EARPHONE or MONITOR jack on the cassette recorder.
4. Insert the other plug on the gray cable into the computer's cassette input jack (marked with an icon that shows an arrow pointing *away from* a cassette).

❖ *Tips for cassette users:* Inexpensive, monophonic cassette recorders work better than more sophisticated stereo recorders. Buy cassettes that are certified for data use, if at all possible. If you cannot find them in your area, use high-quality audio cassettes. Never buy cheap audio cassettes for recording data. One bad spot on a tape can mess up an entire software program.

Day-to-day life with the Apple IIe

This section contains a few tips for living with your computer—how to maximize desk space and how to clean and maintain your system.

Stacking peripheral devices



Figure 1-16
Stacking peripherals for maximum desk space

The Apple IIe and Apple peripherals are designed to take a small amount of desk space. For example, if you have two disk drives, you might put them on top of the Apple IIe and put a monochrome monitor on top of the two disk drives. Some people also place the monitor on a stand. (See Figure 1-16.) If you have only one drive, put it along either side of the computer. To conserve desk space, you can turn the disk drive on its side.

Cleaning the case

Before cleaning the case, disconnect the power cord from the wall. Then, wipe the computer's surfaces lightly with a damp (but not wet), clean, soft cloth. When you are through, plug in the computer. Many people prefer to protect their systems from dust with static-free covers.

Maintaining the system

There are several things you can do to keep your system in optimal operating condition.

Check the main logic board occasionally for the presence of dirt or dust. A heavy buildup of dirt or dust can cause short circuiting. To clean the board, make sure the power is off; then gently remove dust with a soft brush or blow it out. (An aerosol can of compressed air works well.)

An annual service checkup, particularly for disk drives, is a good idea. Your authorized Apple dealer can clean and adjust your disk drives. You might also consider the AppleCare® program; see Appendix B, "Guide to Service and Support," for details.

Also keep these tips in mind:

- Keep your computer and peripheral devices dry. Don't hang or water plants over it, or keep beverages or other liquids near the computer.
- Dust and dirt can cause problems. Keep your work area clean. When leaving the computer for extended periods, cover it. Although a clean cloth is fine, you might prefer dust covers for your computer and peripheral devices.
- Avoid exposing the Apple IIe to rain, snow, or long periods of direct sunlight.
- Read all the installation instructions and warnings carefully.
- Keep these instructions handy.

Warning Electrical equipment may be hazardous if misused. Operation of this product, or similar products, must always be supervised by an adult. Do not allow children access to the interior of the computer and do not permit them to play with the computer, any of its peripheral devices, or cables.

Chapter 1 summary

General installation tips

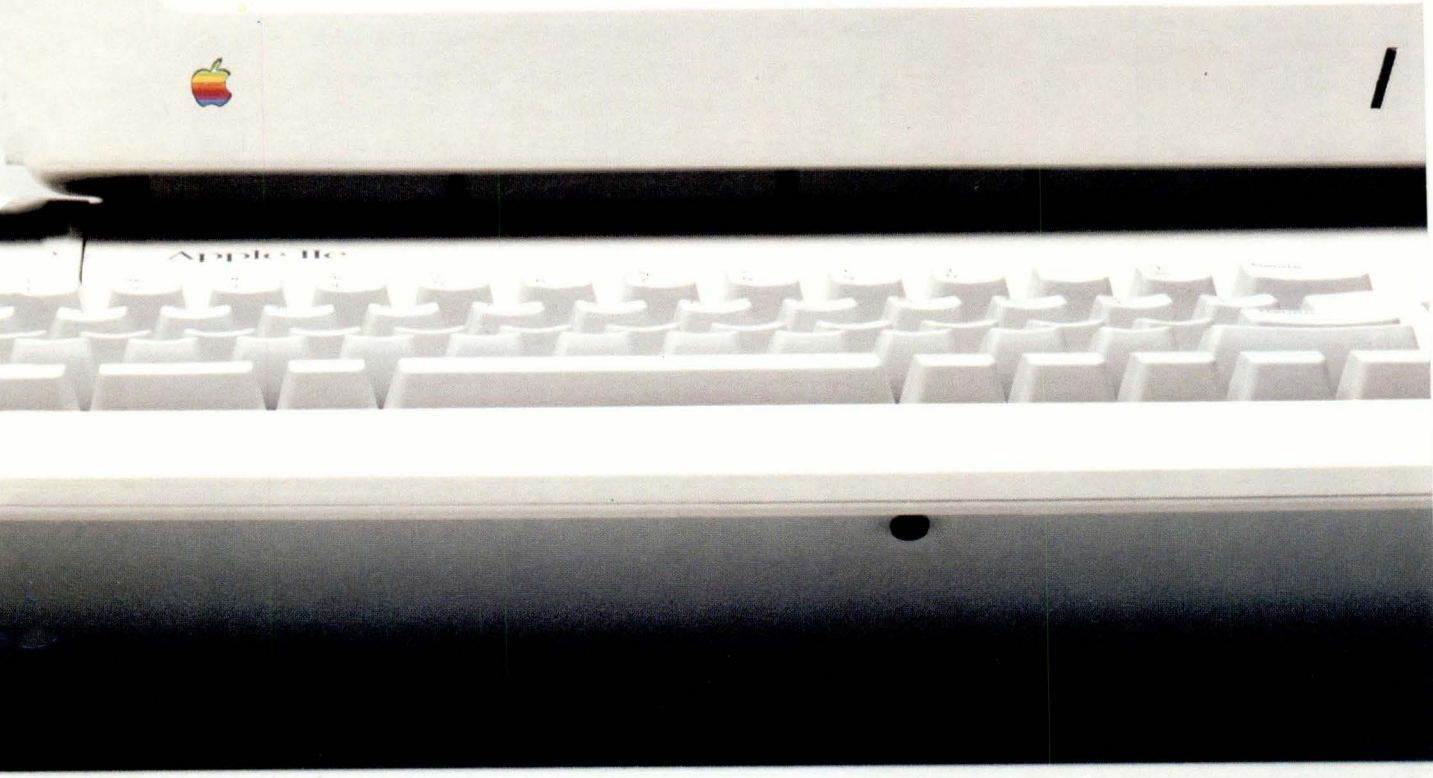
Remember these tips when installing peripheral devices:

- Make sure the Apple IIe power is off and the power cord is plugged in.
- Remember to discharge any static electricity you might have accumulated by touching the power supply.
- Follow peripheral and software manual recommendations for slot assignments and installation.
- Make sure the bare side of peripheral cards face the power supply.
- Install cards by rocking them back to front. Don't force a card straight down or wiggle it from side to side. Don't touch the gold "fingers" on the bottom of the card.
- Make sure the pins on one connector line up with the holes on the other connector.



Chapter 2

Starting the Apple IIe



This chapter shows you how to start and control the Apple IIe. With your system set up and plugged in, all you need is the disk labeled *An Introduction* (on the flip side of *The Inside Story*). This program gives you keyboard practice, while teaching you computer concepts and procedures common to hundreds of Apple IIe programs.

Starting the system

Starting an Apple IIe takes three basic steps:

- Inserting a startup disk in a disk drive
- Switching on the monitor
- Switching on the Apple IIe.

Follow these steps for starting *An Introduction* with a 5.25-inch disk.

1. Open the drive 1 door as your disk drive manual instructs. If you have a recent Apple drive, push in on the little latch, as shown in Figure 2-1. The disk drive door will pop up. If you find a shipping retainer in the drive, remove and discard it.

❖ *Which is drive 1?* If you have two UniDisk™ drives, drive 1 is the drive connected directly to the disk controller card. If you have a DuoDisk™ drive, drive 1 is the drive on the left. If you have two Disk II drives, drive 1 is the drive connected to the set of pins labeled DRIVE 1 on the controller card.

If you have more than one disk controller card, drive 1 is the first drive attached to the controller card in the higher-numbered slot. For example, if you have controller cards in slots 7 and 6, the first disk on the controller card in slot 7 is drive 1.

2. Take hold of the *Introduction* disk by its label and remove it from its paper **envelope.** (Only the disk, not the paper envelope, goes in the drive.) You can handle the disk's black jacket, but do not touch any of the shiny surfaces that the cutout areas expose.



Figure 2-1
Opening a disk drive door

3. With the side reading *An Introduction* facing up, slide the disk all the way into the disk drive. The label should be the last part of the disk to enter the disk drive. See Figure 2-2.

4. Close the disk drive door by pressing down on the latch; the computer can't get information from a disk when the disk drive's door is open. See Figure 2-3.



Figure 2-2
Putting a disk in a disk drive

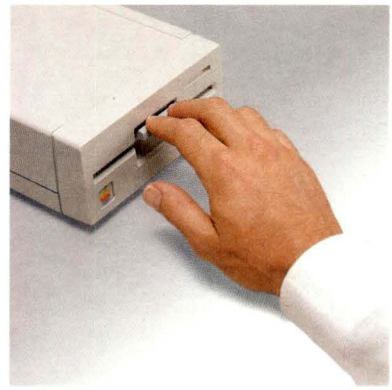


Figure 2-3
Closing a disk drive door

5. Switch on the monitor or TV set. See Figure 2-4.

6. Reach around the rear-left side of the computer and find the power switch in the lower-left corner. Press the upper half of the switch to turn the power on. See Figure 2-5.



Figure 2-4
Switching on the monitor

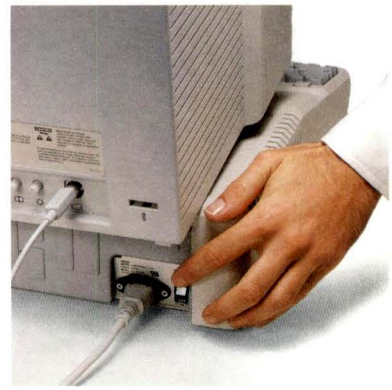


Figure 2-5
Switching on the Apple IIe

When you turn on the power, four things happen:

- The computer beeps.
- The **power light** in the upper-right corner of the keyboard lights up.
- The **in-use light** on the disk drive lights.
- The disk drive spins the disk.

❖ *What's going on?* Every time you turn on the power, your Apple IIe checks drive 1 for a **program disk** (a disk with instructions for the computer). If it finds a program disk in drive 1, it copies the program into the computer's **memory** and starts carrying out the instructions in that program. (Memory stores information while the computer is turned on.) In this case, the program is an educational one, *An Introduction,* but the startup procedure is the same for all programs. For a more detailed account of how the computer works, see Chapter 4, "The Inside Story."

Starting up is sometimes called **booting** from the term *bootstrapping,* to start by one's own effort.

When the computer finishes its work, you should see the **display** or picture on your screen shown in Figure 2-6. If you don't see the right display, consult the next section, "Troubleshooting." If your display matches the one in Figure 2-6, put this manual aside and learn interactively with the Apple IIe as your teacher. Just follow the instructions on the screen. When you finish *An Introduction,* run the program again or continue reading this book.

When you're through with *An Introduction,* take the disk out of the disk drive. Open the drive door, take the disk by its label, and pull. Put the disk back in its envelope for safekeeping. Later in this chapter, you'll find recommendations about other self-paced disk tutorials. Feel free to leave the computer on; the Apple IIe consumes very little power.

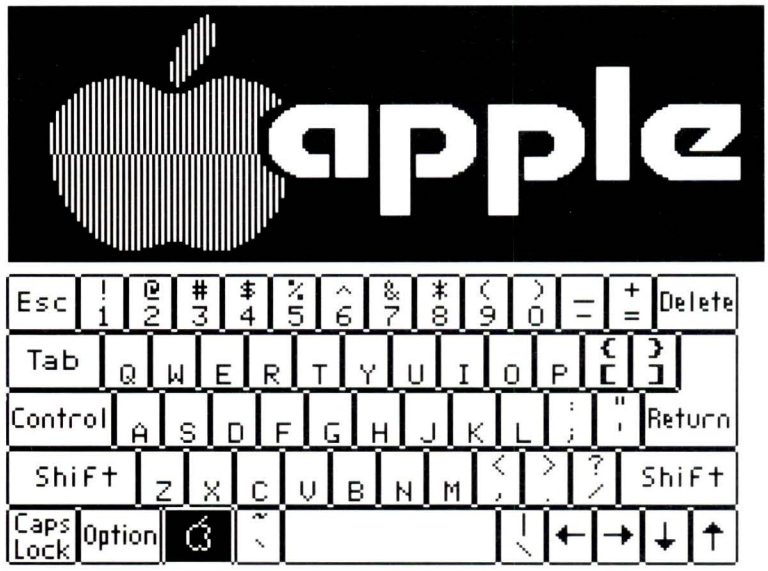


Figure 2-6
An Introduction startup display

Troubleshooting

If you had any difficulty starting the computer, look through this list of common problems and their solutions. If you don't find what you need here, consult Appendix C, a more complete trouble-shooting guide.

The disk drive does not activate.

Turn off the power and make sure your disk drive is connected according to the instructions in Chapter 1 and your disk drive manual.

No picture appears on the screen.

Try adjusting the **contrast knob** or the **brightness knob** on your monitor. If these adjustments don't help, make sure your monitor is

- Turned on
- Connected to the computer
- Plugged in.

The power light above the keyboard doesn't light.

Is the Apple IIe plugged in? If you're using a power strip, make sure the power strip is plugged in and turned on. Is the wall outlet connected to an on-off switch?

A screen for a program other than *An Introduction* appears.

Did you insert the correct disk? Check that the label reads *An Introduction*.

The "wrong" disk drive activates.

The disk drive that starts when you turn on the power *is* drive 1. Turn off the power, put the *Introduction* disk in the drive that started (the true drive 1), and begin again.

If you want a different drive to act as drive 1, you need to change the position of the disk relative to the controller card. The drive that connects directly to the controller card is drive 1 for that controller card's slot. The drive daisy-chained to the first drive is drive 2, and so on.

If you have installed more than one controller card, you may also need to rearrange the positions of these cards. See "Choosing Disk Drive Controller Slots" in Chapter 1.

The disk drive light stays on for an inordinately long time.

You can stop the disk drive by holding down Control while you press Reset. (Whenever you press a Reset key combination, always release Reset first or the combination might not work.) Remove the disk. Is it the correct disk? Consult Appendix C for further help.

You get the message: `THIS IS A DATA DISK, NOT A STARTUP DISK`

This message appears when you try to start with a disk that does not carry a copy of the operating system. Remove the problem disk and insert the correct disk. Then restart the computer by pressing ♁-Control-Reset. Be sure to release Reset first. (If the command doesn't work the first time, try it again.)

You get the message: `I/O ERROR`

I/O stands for *input/output*. **Input** refers to information coming into the computer (from the keyboard, for example). **Output** refers to information traveling out of the computer (to a disk drive or printer, for example).

This message appears when the computer and one of its peripheral devices have a problem exchanging information. Make sure you've got the right disk (*An Introduction*) in drive 1 and that you inserted the disk correctly (label side up with the label going in last). Try removing and reinserting the disk, and then start again. If the disk isn't the problem, turn off the power and make sure your disk drive is connected properly.

Working with a cassette recorder

This section shows you how to start the computer without a disk drive, how to load a program from a cassette tape, and how to save a program onto a cassette. Before you begin, make sure the cassette is in the recorder and, if necessary, rewound. If you don't have a prerecorded program, read the next section on how to start the computer. Then skip to "Saving a Program on Tape," which includes a one-line program that you can save to tape and use to test your loading technique.

- *Tape or disk drive:* A tape recorder is less expensive than a disk drive. However, tapes are slower and less reliable than disks. Perhaps even more important, very few programs are distributed on cassette tape.

Starting without a disk drive

To start the computer without a disk drive, switch on the monitor and the computer. (See Figures 2-4 and 2-5.) The computer will beep and the power light will light. The screen will show the Applesoft prompt (]) and a blinking cursor.

Loading a program from tape

The key to proper loading of programs is the cassette recorder's volume control. If you don't know what the correct volume setting is, try halfway between soft and loud. (The computer cannot use data that is sent either too loudly or too softly.) If your recorder also has a tone control, adjust it toward the treble setting. To load a program from tape, follow these five steps:

1. Type `LOAD` but don't press Return yet.
2. Press the cassette recorder's PLAY button to start the tape.
3. Now, press Return to issue the LOAD command. The cursor will disappear. In a few seconds, the computer will beep to indicate that it has found the beginning of the program. If all goes well, the computer will beep a second time and the cursor will reappear, indicating that the computer has successfully loaded the program. If you get an error message instead, see "Troubleshooting Tape Loading."
4. Stop the cassette recorder.
5. To run the program you loaded, type `RUN` and press Return.

Saving a program on tape

If you don't have a program, and want to try saving one, type this one-line program:

```
10 PRINT "HELLO"
```

Before you record a program, make sure you have a blank tape rewound to the beginning. If you're using a tape that already has a program on it, make sure you advance the tape past the program, or you will record over it. If you are starting from the beginning of the tape, you might also reset the tape counter to 000, so you can note the length of the program after it's saved.

Follow these three steps to save a program on tape.

1. Start recording by holding down the PLAY button while you press RECORD. Both buttons should stay down.
2. Type SAVE and press Return. The cursor will disappear. In a few seconds, the computer will beep to indicate that it has begun to record the program. If all goes well, the computer will beep a second time and the cursor will reappear, indicating that the computer has successfully saved the program.
3. Push the STOP button on the cassette recorder. Make a note of the reading on the tape counter.

❖ *Recording tips:* When saving more than one program on the same tape, write down the tape counter numbers, so you can find programs easily. Also, leave several seconds of unrecorded space between programs. Many people make several recordings of important programs. This way, if one recording is bad, they have extra versions.

Troubleshooting tape loading

Recorder volume is the most important factor in loading problems. If you are having trouble, experiment with different volumes. Normally the best level lies between 50% and 70% of maximum volume. As part of your experimentation, you can disconnect the input cable from the recorder and listen to the data recorded on the tape. Adjust the volume so that the sounds are crisp and clear, neither faint nor distorted. Once you find a good setting, paint a mark on the case and volume dial so you can readily set volume. Be sure to plug the cable back into the MICROPHONE jack before using the recorder with the computer.

If experimentation doesn't work, have an electronics technician check the head alignment on the recorder. Improperly aligned heads can distort data recordings.

Keyboard review

As *An Introduction* pointed out, the Apple IIe keyboard looks like a typewriter keyboard with several special keys and a numeric keypad to the side. Figure 2-7 identifies and gives brief descriptions of all the special keys. The rest of this section describes these keys in greater detail.

Figure 2-7
The Apple IIe keyboard





Delete: Usually erases the character to the left of the cursor.

Arrow keys: Move the cursor in the direction indicated.

Esc: Same as main Esc key.

Return: Moves the cursor to the next line or tells the program to accept an entry and continue.

Enter: Same as Return.

Numeric keypad: Provides a calculator-style layout for quick numeric entries.

Return

The *cursor* is a little square, a vertical line, or a dash on the screen that marks where the next character you type will appear.

Data is a general-purpose term for anything you give the computer to process—words, numbers, or codes.

Return has two common functions. In a word processing program, pressing Return moves the **cursor** to the left margin of the next line. When you're entering **data** or issuing a command to the computer, Return tells the computer to act on what you've just typed.

Esc

Computer programs often give you a list of choices. This list is called a *menu*. Some menus are multilevel—you make a choice from one menu and another menu appears.

Pressing Esc (for *Escape*) usually causes a program to move back one or more levels on a **menu.** The Escape key may also cause a program to halt ("escape") from a process. The Esc key on the main keyboard and the one on the numeric keypad work the same.

Delete

With some programs, you can press Delete to erase characters to the left of the cursor. It erases by **backspacing;** it doesn't erase the character under the cursor.

❖ *Apple lore:* Early models of the Apple II didn't have a Delete key, so nothing happens when you press Delete in some older programs. If Delete doesn't work, see the program's manual for details on how to erase characters.

Shift and Caps Lock

The Shift key works just like the shift key on a typewriter. You hold it down while you type another key. The result is an uppercase letter when pressed with a letter key or the upper character on a key with two characters (like the number and punctuation keys in the top row).

If you want all capital *letters,* press Caps Lock. When Caps Lock is down, the computer capitalizes all the letters you type, but no other keys are affected. For example, a *2* will not become @. Thus, you can type numbers and capital letters without pressing and releasing Shift all the time.

❖ *Apple lore:* Early models of the Apple II didn't have a Caps Lock key because all letters appeared in uppercase. Consequently, programs designed for early models of the Apple II don't recognize lowercase letters and either don't respond to your typing or issue an error message like `SYNTAX ERROR`. To get these programs to run correctly on your Apple IIe, you must press Caps Lock down.

Applesoft BASIC and DOS 3.3

If you're using the DOS 3.3 operating system and programming in Applesoft BASIC, you must type instructions in all uppercase characters, or you'll get a `SYNTAX ERROR` message. The ProDOS operating system, on the other hand, does not require capitalization.

Keys that move the cursor

In programs that have a cursor, the cursor's initial position is usually in the upper-left corner of the screen. The cursor moves to the right with every character you type. In many programs, particularly word processing programs, the cursor moves to the next line automatically, when it reaches the end of a line (you don't have to press Return). This is called **wraparound.**

Arrow keys

You can move the cursor to a different position by pressing the appropriate **arrow key,** located in the bottom-right corner of the keyboard. Pressing Up Arrow moves the cursor one line up. Pressing Down Arrow moves the cursor one line down. Pressing Left Arrow moves the cursor one character to the left. And pressing Right Arrow moves the cursor one character to the right.

❖ *Apple lore:* Early models of the Apple II didn't have up and down arrow keys, so programmers reprogrammed certain keys for vertical cursor movements. Different programmers chose different ways to do this. If you work with a program that doesn't take advantage of the arrow keys, check the program's manual for cursor movement commands.

Tab

Tab moves the cursor forward by a preset number of characters (usually eight). In some programs you can set your own tabs, just as you can on a typewriter.

Keys that control other keys

The Control, Apple, and Option keys work in combination with other keys to perform special functions. For example, a program might have you press Ó-P to **print** your work. Because key combinations vary from program to program, your best strategy is to read the program manual's descriptions of key combinations and their functions.

❖ *Apple lore:* Earlier Apple II keyboards used a Solid Apple key (◆) instead of the Option key. If you see a reference to *Solid Apple,* substitute the Option key. Further, Ó was referred to as *Open Apple,* rather than just the *Apple* key. If you see a reference to *Open Apple,* use the Apple key, Ó.

Reset

The Reset key stops the computer in the middle of what it's doing and returns it to the state it enjoys just after you've switched on the power. Normally, you lose unsaved data when you press a Reset key combination. Because Reset is so powerful, it always works in combination with other keys, so that you can't reset the computer accidentally. The three most common Reset operations are

- Apple-Control-Reset to restart the computer. (You'll learn more about this later in this chapter.)
- Control-Reset to stop the current process, like a disk that won't stop spinning.

- Option-Control-Reset to start a diagnostic self-test. (You don't need to perform this test unless you suspect something's wrong with your computer.) The test lasts about 20 seconds. During that time, moving patterns appear on the screen, indicating that the test is running. The message `SYSTEM OK` means your computer is healthy. If you get any other message, consult your authorized Apple dealer.

Important Whenever you press a Reset key combination, always release the Reset key first. (If the command doesn't work the first time, try again, making sure to release Reset first.)

Keys unlike typewriter keys

People sometimes type the letters *l* and *O* interchangeably with the numbers *1* and *0* on a typewriter. But a computer gives completely different values to letters and numbers. So, if you type letters instead of numbers, the computer may respond with an error message.

On a typewriter, a space is exactly that, an area on the paper where nothing is typed. However, on a computer, pressing the Space bar inserts a space *character*. Just as an *l* (el) and a *1* (one) are different, so is a space character and the space left by pressing Right Arrow. When working with a data base program, spaces are also important. For example, the word *Jones* and the word *Jones* followed by a space are as different as *Jones* and *Smith*.

Keys on the numeric pad

The keys on the numeric pad are arranged like those on a calculator to make entering numbers and arithmetic formulas easier. The Enter key operates just like the Return key. The Esc key works like the Esc key on the main keyboard.

Starting and stopping the Apple IIe

There are two ways to start Apple IIe programs—one for when the power is off, the other for when the power is already on. If you have installed two disk controller cards, be sure to read "Starting From a Drive in a Lower Slot."

Starting with the power off

Here's a review of the first startup method (the computer is off), sometimes called a **cold start:**

1. Put a program disk in drive 1. (Close the drive door, if necessary.)
2. Switch on the monitor.
3. Switch on the Apple IIe.



Figure 2-8
Starting when the computer is off

Starting with the power on

When the computer is on and you want to start a different program, use this method, called a **warm start.** It reduces wear on the power switch and other computer components.



Figure 2-9
Starting when the computer is on

1. Make sure the in-use light is off. Remove the current program disk from drive 1.
2. Put a program disk in drive 1.
3. Hold down ♁ and Control while you press Reset. Release Reset first and then the other keys.

❖ *Restarting with the power switch:* If you choose the cold start as a way of switching from one program to another, wait at least 30 seconds from the time you turn off the power until you turn it on. Otherwise, the computer may not respond at all. If your computer still fails to respond, turn it off and wait a full minute before you turn it on again.

You can practice the ♁-Control-Reset method of starting the *Introduction* disk. When you see the title display, press Esc (unless you want to go through *An Introduction* again).

Starting from a drive in a lower slot

As pointed out in Chapter 1, if you have 3.5-inch drive in a higher-numbered slot than a 5.25-inch drive, you can start from the 5.25-inch drive even if the 3.5-inch drive is empty. The operating system will automatically drop down to the lower-numbered slot if it finds the 3.5-inch drive empty. (This is also true if you have two 3.5-inch drives on separate disk drive controller cards.)

However, a 5.25-inch drive that does not contain a startup disk cannot pass control down to a lower slot. For example, if you have a 5.25-inch drive in slot 6 that lacks a startup disk and a 3.5-inch drive in slot 5, you can't start automatically from slot 5. You can, however, start from the lower slot by including an intermediate step.

Follow these four steps:

1. Put the desired startup disk in the 3.5-inch drive (lower slot) and, if necessary, a data disk in the 5.25-inch drive (higher slot).
2. Start the system (either a warm start or a cold start is OK). After trying to start from the 5.25-inch disk drive, the computer issues the message `THIS IS A DATA DISK, NOT A STARTUP DISK.`
3. Press Control-Reset. The BASIC square bracket (`]`) prompt appears.
4. Type `PR#5` and press Return. The system responds by activating the disk drive in slot 5.

❖ *PR#: PR* means *print to* the slot number that follows the number sign (#). Thus, by typing `5`, you tell the computer to "print" (that is, to send) its startup instructions to slot 5. If the lower-numbered drive were in slot 6, you could just as easily type `PR#6`.

Ending a session

To end a session at the computer, follow these four steps:

1. Save your work. Every application program has a way to save work. (See the program manual for details.) When you use your computer, your work is stored in the computer's memory only as long as the power is on. If you want a permanent copy of your work, you must **save** it on a disk before turning off the power.
2. Wait until the in-use light is off. The in-use light tells you when the disk drive is **reading** (retrieving something) and **writing** (recording something) on the disk. If you turn off the computer while the light is on, you could damage the disk and lose some of the information recorded on it. If something goes wrong and the in-use light stays on for an inordinately long time, you can stop the disk drive by holding down Control while you press Reset.
3. Remove your disk(s) from the drive(s).
4. Switch off on the monitor and the computer.

Looking ahead

In terms of day-to-day work with your computer, Chapter 3, "More About Disks," is the most important. The reason is that all computer work revolves around disks: You start your computer with a disk, the programs you buy come on disks, and you store data on disks. Chapter 3 discusses how disks work, how to handle disks, and how to perform simple but important disk tasks.

Chapter 4, "The Inside Story," can give you a basic understanding of the "why's" behind the things you do with the computer. *The Inside Story* tutorial disk complements Chapter 4.

Read Chapters 5, 6, and 7 at your leisure. They contain a wealth of information about products and services that can help you become more productive with your computer. You may want to read Chapter 5, "Software," with the *Apple at Work* disk tutorial. This tutorial gives you a hands-on introduction to the three most popular types of application software—word processors, spreadsheets, and data bases.

Many people buy an Apple IIe to do a particular task like writing letters. They have little interest in the computer itself or in programming. However, if you are curious about the subject of programming, take advantage of the powerful, programming language built into the Apple IIe—Applesoft BASIC—and the book *A Touch of Applesoft BASIC* to get you started. Whether to satisfy curiosity, to find a whole new realm of mental stimulation, or to create exactly the software you require, Applesoft is worth your investigation.

Chapter 2 summary

Starting with the power off

1. Put a program disk in drive 1.
2. Switch on your monitor.
3. Switch on your Apple IIe.

Starting with the power on

1. Put a program disk in drive 1.
2. Hold down ♁ and Control while you press Reset. (Always release Reset first.)

Ending a lesson

1. Save your work.
2. Wait until the disk drive light is off.
3. Remove your disk(s) from the drive(s).
4. Switch off on the monitor and the computer.

Stopping a disk that spins too long

Press Control and hold it down while pressing Reset.

Special keys

Arrow keys: Move the cursor in the direction indicated.

Caps Lock: Capitalizes all letters but doesn't affect two-character keys.

Control, Apple, Option: Make other keys behave differently.

Delete: Erases characters to the left of the cursor.

Enter: Does the same thing as Return.

Esc: Gets you back to a previous menu or halts the current process.

Numeric keypad: Permits quick calculator-like numeric entries.

Reset: Halts and resets the microprocessor; always pressed in combination with other keys.

Return: Indicates that you've finished reading or typing and that you're ready to proceed.

Shift: Gives the uppercase version of a letter key or the upper character on a two-character key.

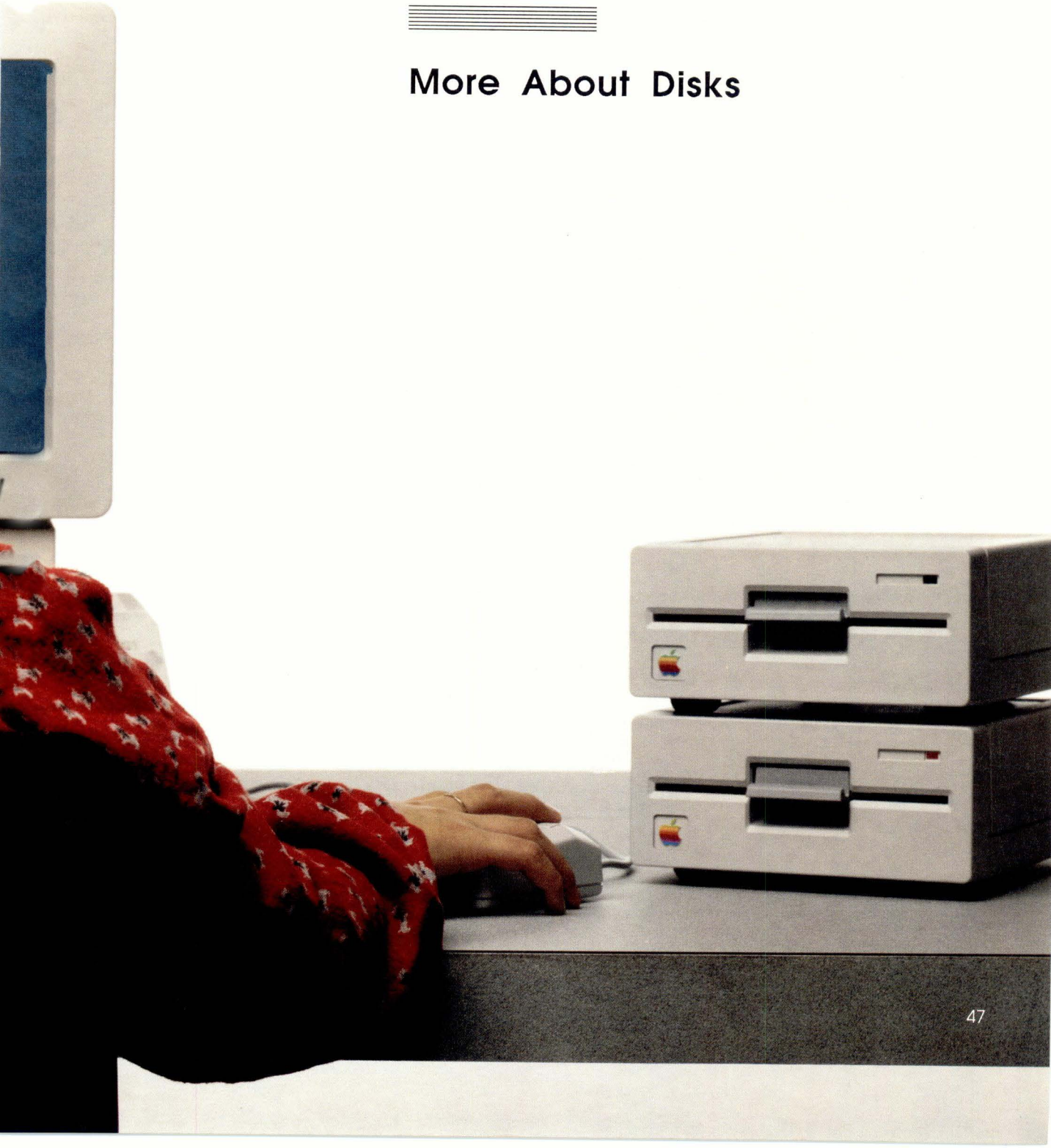
Space bar: Inserts a space character.

Tab: Moves the cursor forward a preset number of characters (usually eight).


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Chapter 3

More About Disks



This chapter introduces you to disks: what they are, how to take care of them, and how to use them. You'll also find a discussion of important **disk utility** commands toward the end of the chapter.

Introducing disks

Apple computers work with two types of disk—the traditional 5.25-inch disk (also known as a **floppy disk**) and the more recent 3.5-inch disk. The 5.25-inch disk can store 140K (143,360 bytes). The 3.5-inch disk has an 800K (819,200 bytes) capacity.

A disk acts like a file cabinet in which you can store information. In fact, any grouping of information with a name is called a **file.** Files include programs, letters you write with word processing software, budgets created with spreadsheets, and address lists created with a data base program. Just as with paper files, the files you keep on disk can be saved, changed, sorted, or thrown away.

A disk, regardless of its size, is basically a place to keep information. Just as you store documents in a file cabinet, you can store information on a disk. Files that you save on a disk are recorded magnetically. Nonetheless, computer users normally refer to *writing* data to disk and *reading* data from disk. Some programs refer to disk files as **documents.**

Two other common terms are *program disk* and *data disk*. The difference between the two lies in their contents. Typically a **program disk** contains one or more programs, such as a word processing program. A **data disk** contains the information that you create with a program. Storing different files by topic (addresses, letters, budgets, for example) on different data disks is a good way to classify information for easy access. People with two drives often run their programs from the startup drive and store their data on a disk in the second drive.

❖ *How long will a floppy disk last?* You can expect years of service from a good-quality floppy disk, given proper care and handling.

Another kind of disk is the **hard disk.** Hard disks can store far greater amounts of data and handle data far more quickly than a 5.25-inch or a 3.5-inch disk can. Hard disks with 10- and 20-megabyte capacities are common. (A **megabyte** is approximately one million bytes or characters.) Hard disks are also called *fixed, rigid,* or *Winchester disks.*

Although 5.25-inch disks and 3.5-inch disks have a great deal in common, they are different enough to warrant separate sections for the following topics:

- Disk anatomy
- Care and handling of disks
- How disks work
- Putting a disk in a drive
- Write protecting a disk

The next section describes 3.5-inch disks. If you aren't using 3.5-inch disks, you can skip to the following section on 5.25-inch disks.

The 3.5-inch disk

Learning the parts of a disk provides a good background for understanding how disks work and how to take care of them. Figure 3-1 shows the anatomy of a 3.5-inch disk.

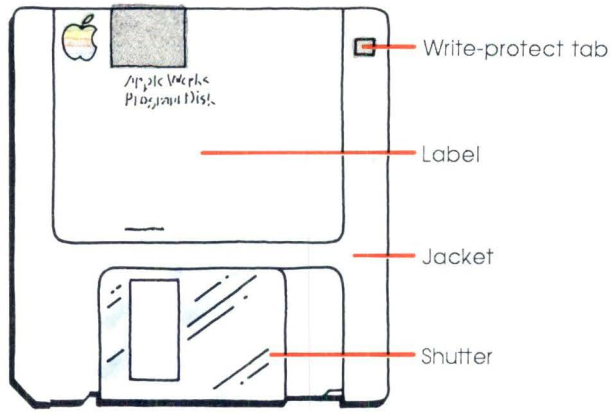
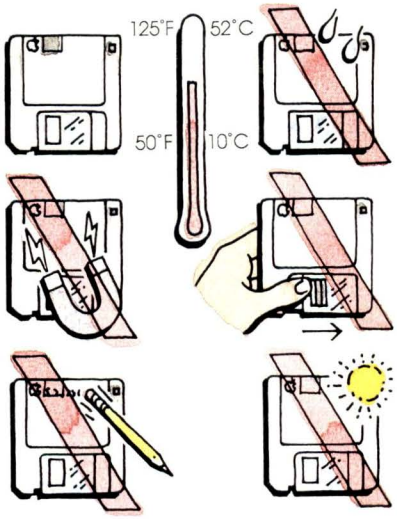


Figure 3-1
Anatomy of a 3.5-inch disk

The disk itself is a circular sheet of plastic with a metallic oxide coating. A hard plastic **jacket** contains and protects the disk. The disk jacket protects the disk in two ways. First, it keeps dust, fingerprints, and other foreign substances from reaching the disk surface. Second, it gives you the means to protect the disk's contents from unwanted changes. (See "Write Protecting a 3.5-Inch Disk.") The jacket also contains a liner that cleans and lubricates the disk when the disk spins.

- *What kind of disks to buy:* Always buy high-quality, name-brand disks. The cheap, no-name disks are made of lower-quality materials and tend to break down or wear out rather quickly. When a disk goes bad, the computer can no longer read it, and your work is lost. When buying 3.5-inch disks, always make sure you get *double-sided* disks. The disk drive works with both sides of the disk. A single-sided disk has a capacity of only 400K.



Caring for 3.5-inch disks

The most important rule in caring for 3.5-inch disks is never to open the shutter and touch the disk beneath it. Also, keep these rules in mind:

- Keep disks away from magnets or devices containing magnets, like telephones, television sets, unshielded monitors, copy stands with magnetic paper holders, batteries, and large motors.
- Keep disks away from moisture.
- Keep disks away from direct sunlight and extremes of heat and cold. On a hot day, the heat that builds up in car trunks, on dashboards, and in glove compartments can ruin a disk.
- Don't use an eraser on a label. Eraser particles can damage the disk if they get under the shutter.
- To keep dust and other foreign matter away from the disk itself, do not slide the shutter open.

❖ *Dust and the 3.5-inch disk:* Dust is not a danger to the 3.5-inch disk itself. However, introducing dust into the disk drive could cause problems. Although the plastic envelopes that come with 3.5-inch disks afford some protection against dust, they tend to be more trouble than they're worth.

How 3.5-inch disks work

When you put a disk into the drive, the drive slides the shutter open, exposing the disk itself to the **read-write head,** and then spins the disk inside its jacket As the disk spins, this head either reads data from the disk or writes new data on the disk.

When you save your work on a disk, the read-write head records your work on the disk as magnetic patterns. When you load information into the computer's memory, the read-write head copies these patterns from the disk. This is much like the activity of the record and play heads on a cassette recorder. The disk records and plays data patterns; the cassette records and plays sound patterns. Chapter 4, "The Inside Story," covers the relationship between the computer and the disk in more detail.



Figure 3-2
Inserting a 3.5-inch disk into a drive

Putting a 3.5-inch disk into a drive

To put a 3.5-inch disk into its disk drive, follow these three steps, illustrated in Figure 3-2:

1. Make sure there isn't a disk in the drive already. If there is, press the eject button to eject the disk.

❖ *Ejecting a disk when the computer is off:* If the computer is off, straighten a paper clip and insert one end of the clip into the little hole to the right of the slot. Press the wire in only until the disk ejects.

2. Grasp the disk by the label with the label facing up. If the disk doesn't have a label, make sure the metal shutter enters the drive first. (The metal "button" in the center of the disk should never face up.)
3. Push the disk in until you feel the drive take the disk. (When the computer is on, you'll hear the drive whir as it reads the disk.)

Write protecting a 3.5-inch disk

The 3.5-inch disk has a write-protect tab in the upper-right corner of the disk. Slide the tab toward the upper edge of the disk to "lock" the disk; that is, to protect the data from changes. To unlock the disk, slide the tab back so it covers the rectangular hole. See Figure 3-3.

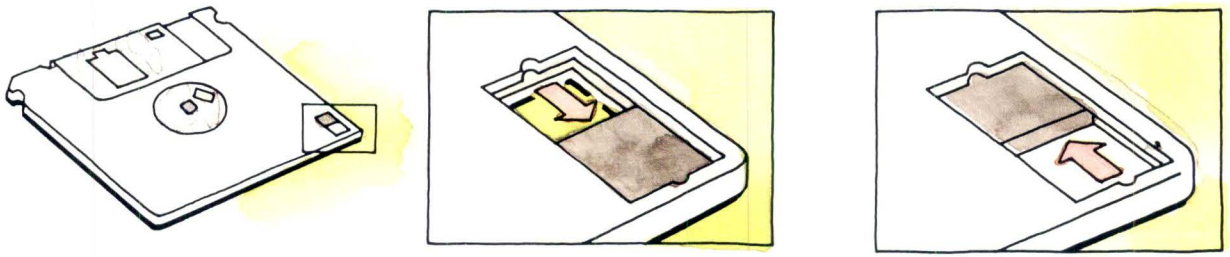


Figure 3-3
Setting the write-protect tab on a 3.5-inch disk

The 5.25-inch disk

Learning the parts of a disk provides a good background for understanding how disks work and how to take care of them. Figure 3-4 shows the anatomy of a 5.25-inch disk.

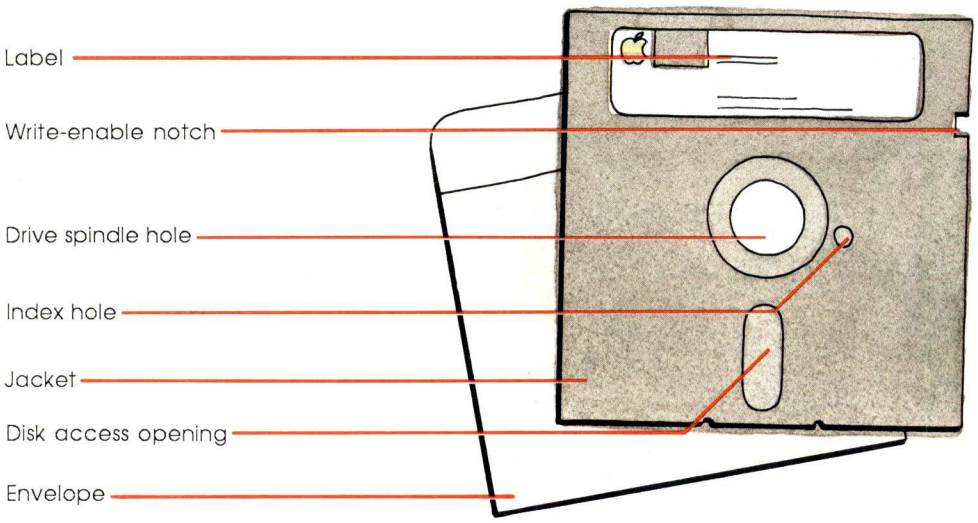
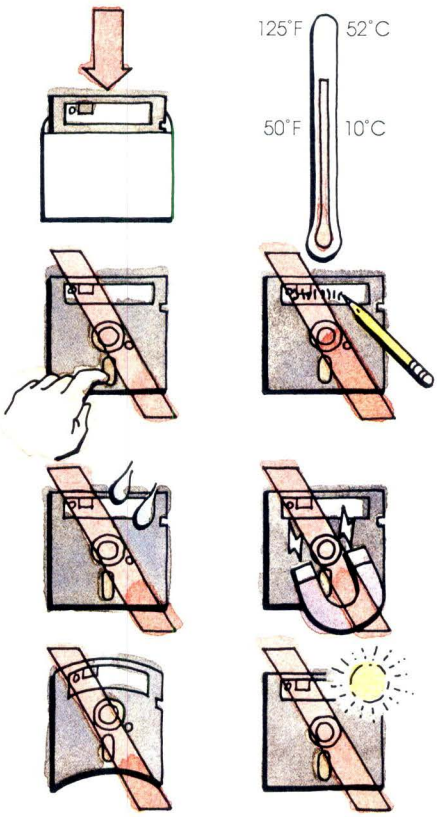


Figure 3-4
Anatomy of a 5.25-inch disk

The disk itself is a circular sheet of plastic with a metallic oxide coating. A flexible plastic **jacket** contains and protects the disk. The disk jacket protects the disk in two ways. First, it keeps dust, fingerprints, and other foreign substances from reaching the disk surface. Second, it gives you the means to protect the disk's contents from unwanted changes. (See "Write Protecting a 5.25-Inch Disk.") The jacket also contains a liner that cleans and lubricates the disk when the disk spins.

- *What kind of disks to buy:* Always buy high-quality, name-brand disks. The cheap, no-name disks are made of lower-quality materials and tend to break down rather quickly. When a disk goes bad, the computer can no longer read it, and your work is lost. Although most retailers know what you want when you ask for a box of disks for an Apple II computer, you should specify *single-sided, double-density, soft-sectored, 40-track disks.*



Caring for 5.25-inch disks

The most important rule in caring for disks is never to touch any exposed area of the disk itself. Always handle a disk by its jacket. Also, keep these rules in mind:

- Keep disks away from magnets or devices containing magnets, like telephones, television sets, unshielded monitors, copy stands with magnetic paper holders, batteries, and large motors.
- Store 5.25-inch disks in the envelopes in which they came.
- Store disks vertically to keep dust from collecting on them. Some people prefer to store disks in plastic disk boxes or special disk albums for further protection (and better organization).
- Use a felt-tip pen to write on the disk label. A pencil or a ball-point pen can dent the recording surface of a 5.25-inch disk and thereby ruin data.
- Don't place anything on a disk. A sharp edge or too much pressure could damage the disk.
- Don't use an eraser on a label. Eraser particles can damage the disk.
- Don't attach paper clips to disks.
- Keep disks away from moisture.
- Keep disks away from direct sunlight and extremes of heat and cold. On a hot day, the heat that builds up in car trunks, on dashboards, and in glove compartments can ruin a disk.

How 5.25-inch disks work

When the computer activates the drive, the disk spins inside its jacket. As the disk spins, the area of the disk that can store data passes under the *disk access opening,* exposing the area to the **read-write head.**

When you save your work on a disk, the read-write head records your work on the disk as magnetic patterns. When you load information into the computer's memory, the read-write head copies these patterns from the disk. This is much like the activity of the record and play heads on a cassette recorder. The disk records and plays data patterns; the cassette records and plays sound patterns. Chapter 4, "The Inside Story," covers the relationship between the computer and the disk in more detail.

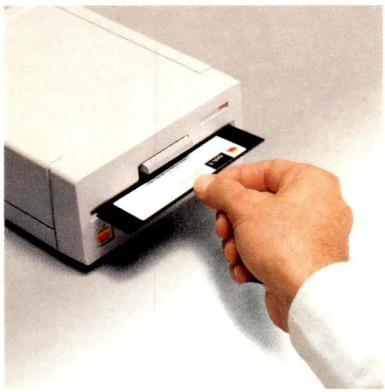


Figure 3-5
Inserting a 5.25-inch disk into a drive

Putting a 5.25-inch disk into a drive

To put a 5.25-inch disk in a drive, follow these four steps, illustrated in Figure 3-5:

1. Open the drive door. If a disk is in the drive, remove it. (A drive can work with only one disk at a time.)
2. Grasp the disk by the label with the label facing up. If the disk doesn't have a label, make sure the seams on the disk jacket face downward.
3. Slide the disk into the drive as far as it will go. (Do not force the disk.) The trailing edge of the disk should be inside the drive, so that you can close the drive door.
4. Close the drive door. A drive cannot work with a disk when the drive door is open.

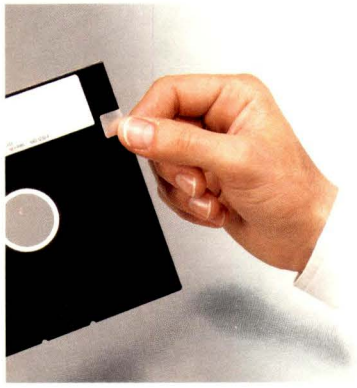


Figure 3-6
Putting a write-protect tab on a 5.25-inch disk

Write protecting a 5.25-inch disk

You can protect important files from accidental changes. On 5.25-inch disks the key to protection is the notch in the upper-right corner of the disk jacket, the **write-enable notch.** When the notch is uncovered, the disk drive can write new data on the disk and erase data currently stored there.

To protect the contents of a disk from accidental changes, cover the write-enable notch with a removable **write-protect tab.** See Figure 3-6. (You'll find sheets of write-protect tabs packed with boxes of blank disks.)

- *No write-enable notch:* Many program disks have no write-enable notch. Software publishers do this to keep you from accidentally erasing the program.

Working with disk utilities

Disk utilities are programs that work directly with files (copying, renaming, deleting) and disks (preparing them for data or checking for problems). This section describes six basic utilities:

- Formatting a disk
- Cataloging a disk
- Copying a disk
- Copying a file
- Deleting a file
- Renaming a file

The *System Utilities* book gives you detailed instructions on how to use these utilities. Read their descriptions here and then put them to work.

❖ *Hard disk and 3.5-inch disk users:* Create **subdirectories** to group related files (business letters, budgets, and so forth). Subdirectories make locating data easier. The *System Utilities* book explains subdirectories.

Formatting a disk

Before you can put data on a blank (fresh out of the box) disk, you must **format** the disk. Formatting is a process whereby the operating system sets up a pattern of **tracks** and **sectors** on the disks. These sectors act like a group of little file cabinets, identifiable places where the computer can store and retrieve data. Formatting is also known as **initializing.**

When you get a new box of disks, format all of them. If you work with more than one operating system (Apple has three: ProDOS, DOS 3.3, and Pascal), format some for each. Write the name of the operating system on a label and apply it to the disk. This is important because a program running in one operating system can't work with a disk formatted by a different operating system.

Although it takes a few extra minutes at the outset, formatting a box of disks in one sitting saves time in the long run. More important, you won't find yourself caught with a Disk Full message and no formatted disk. (Although you can format disks from within some programs, with most you have to quit the program to format disks. This could mean a loss of data.)

A few notes. First, the Duplicate a Disk utility (described in the next section) automatically formats a disk before copying. Second, formatting erases all data on a disk. Erasing data becomes a consideration when you want to "recycle" a disk on which you have stored data. Always check the catalog of any used disk before you format. The format command always gives you a choice of not formatting.

Cataloging a disk

One of your most common questions may become, "What's on this disk?" What you are asking for is the disk's **catalog** or **directory.** The utility program that does this is Identify and Catalog a Disk. A catalog includes:

- The disk or **volume name**
- The name of each file on the disk (the **filenames**)
- The type of file (text, binary, BASIC, and so on)
- The file size in **blocks**
- Other disk information.

A *block* is a disk unit of information consisting of 512 bytes. Disk operating systems allocate data to blocks on a disk.

❖ *File types:* Application programs often tell you what kind of file you've created by adding a suffix to the filename. For example, a word processor file might add the suffix *.DOC* (for document); a spreadsheet *.WKS* (for worksheet); a data base *.DBF* (for data base file). Some application programs also make backup files automatically and add the suffix *.BAK.*

Copying a disk

Although disks are relatively sturdy, they can be damaged, lost, or stolen. To protect important information, make copies of your disks. Some people make multiple copies and store one set of disks in another room or building for extra protection.

Although you can and should copy your own work, you'll often find that the programs you buy are **copy protected.** Many software publishers make their disks uncopyable to protect their products from **software pirates,** who illegally duplicate programs.

If a program is copy protected, the publisher generally provides one backup copy or tells you in the program manual how to replace a damaged program disk at a nominal cost.

To copy a disk, choose the Duplicate a Disk command.

Important

If you must copy files from a 3.5-inch disk to a 5.25-inch disk, it's a good idea to copy individual files rather than the whole disk. A 3.5-inch disk can store over five times as much data as a 5.25-inch disk. However, if the 3.5-inch disk has less than 140K on it, you can use the Duplicate a Disk command.

Copying a file

Sometimes you don't want to copy a whole disk, but just one or so files for backup purposes or to share with a colleague. To do this, choose the Copy Files command. You can copy one or more files without copying the whole disk.

Deleting a file

As you work with your computer, you'll find files you no longer want taking disk space (old letters, out-of-date budgets, and the like). You can recover disk space by erasing such files from the disk with the File Delete command.

Warning

Deleted files are gone forever (unless you have a file-recovery utility or a backup copy of the file). Always check the contents of old files before deleting.

Renaming a file

From time to time, you'll probably want to change a file's name (you didn't like the name you first gave it, or the first draft has become the second draft). Select the File Rename command.

Chapter 3 summary

Disk care

Always exercise care when handling or storing disks. Particularly, keep them away from dirt, liquids, direct sunlight, extremes of temperature, and anything magnetic.

Write protecting a disk

- For a 5.25-inch disk, put a write-protect tab over the write-enable notch.
- For a 3.5-inch disk, slide the write-protect tab toward the top edge of the disk.

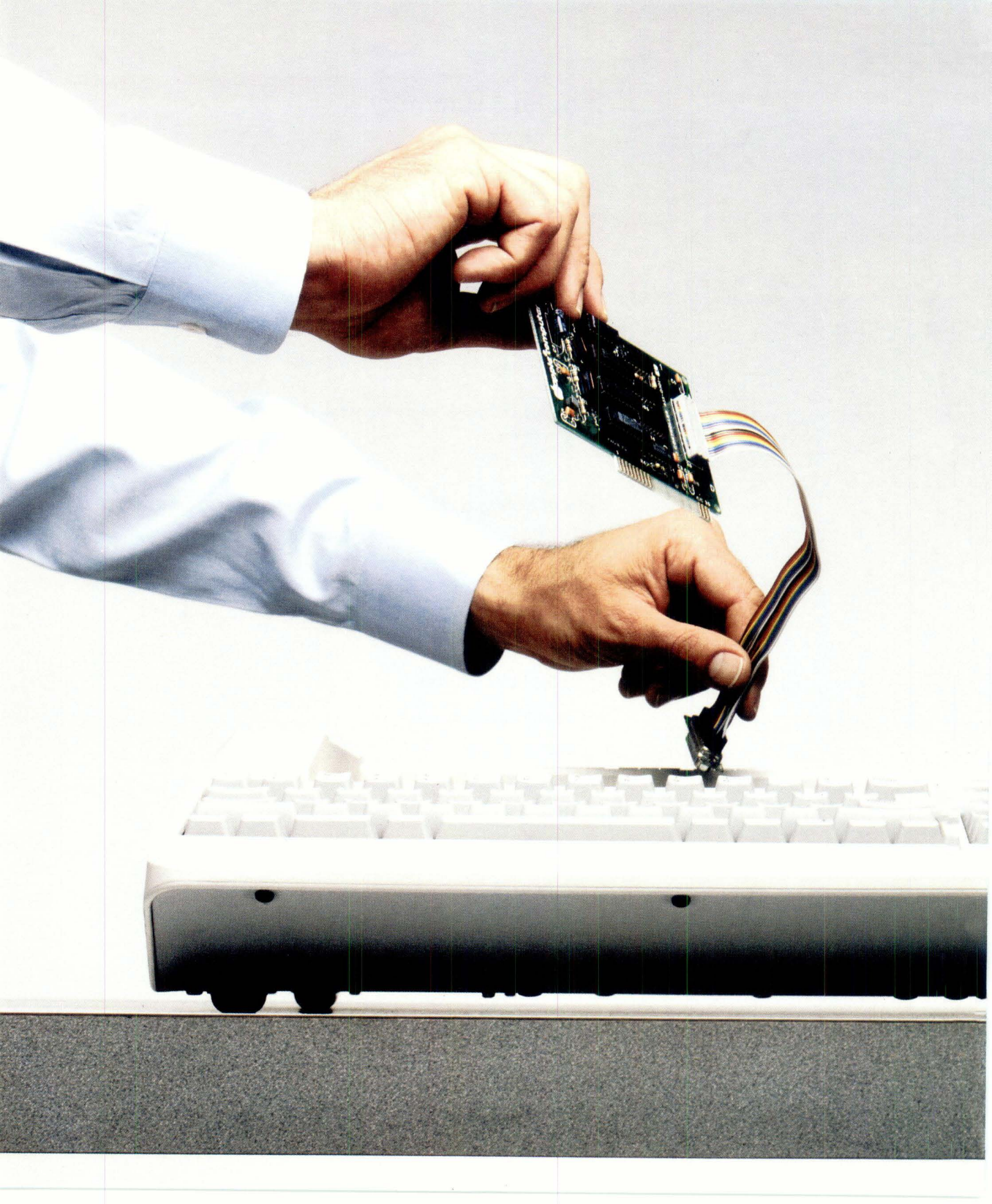
Write enabling a disk

- For a 5.25-inch disk, remove the write-protect tab from the write-enable notch.
- For a 3.5-inch disk, slide the write-enable tab backward to cover the rectangular hole.

Important disk utilities

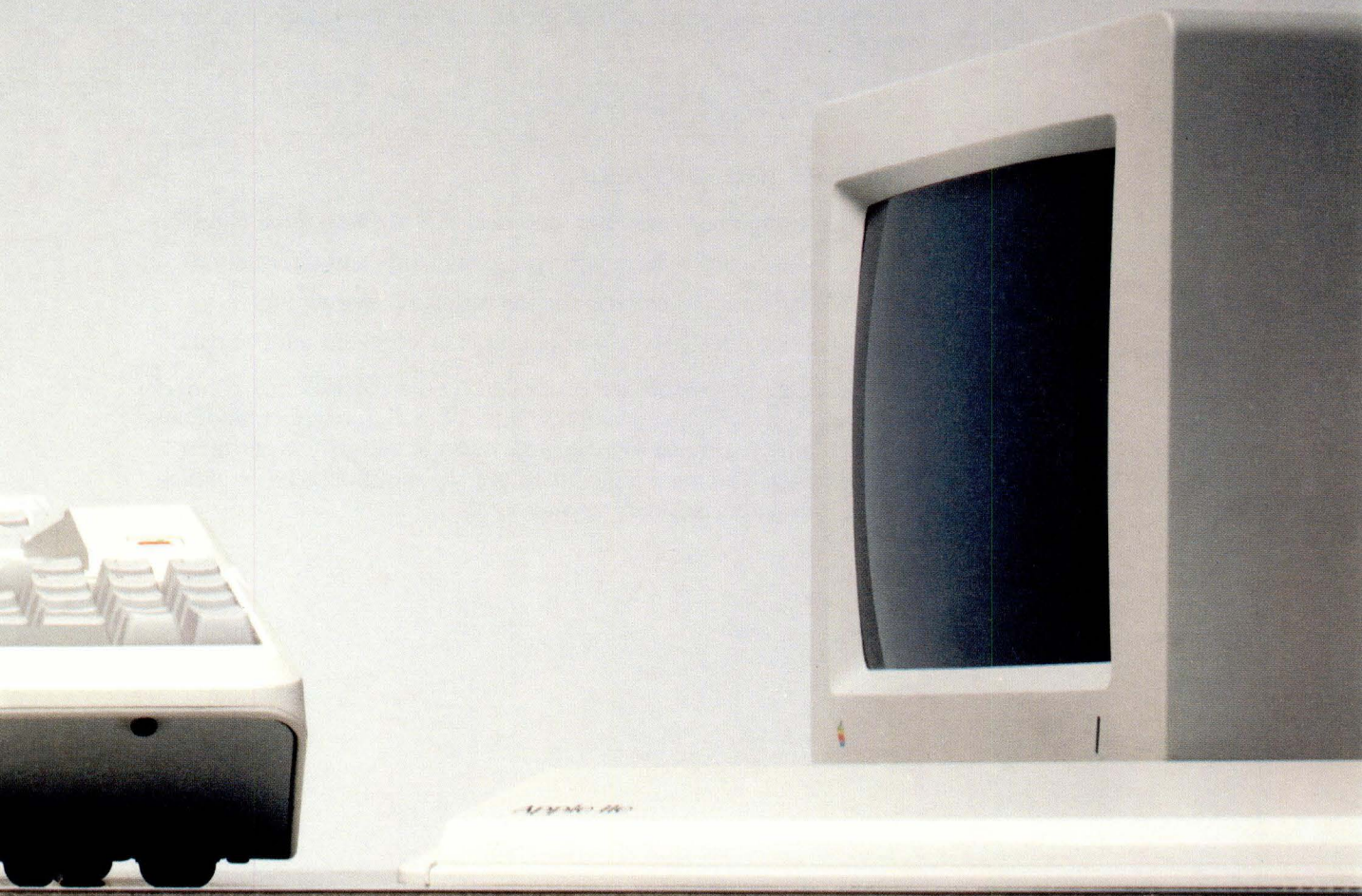
- Formatting a disk
- Cataloging a disk
- Copying a disk
- Copying a file
- Deleting a file
- Renaming a file

See the *System Utilities* manual for details.



Chapter 4

The Inside Story



This chapter introduces you to the inner workings of your computer. It isn't a technical discussion so much as a look at the relationships that exist between the main parts of the computer and at how those relationships affect your work. You may want to run the *Inside Story* tutorial disk before reading this chapter.

You don't need to know how a computer works to run programs successfully. However, having a feel for what happens when you start the computer, create information, and save and retrieve a file can make your sessions with the computer more productive and enjoyable.

Meet the players

When using your computer, you deal directly with three elements:

- The keyboard (where you type commands and information)
- The monitor (where you see the results of your typing)
- The disk drive (where you put disks to store and retrieve data).

These three elements are controlled by the computer. A computer is not, however, a single entity, but rather a group of components mounted on a **main logic board,** illustrated in cartoon form in Figure 4-1. The main logic board is a sheet of fiberglass on which the computer's circuitry is mounted.

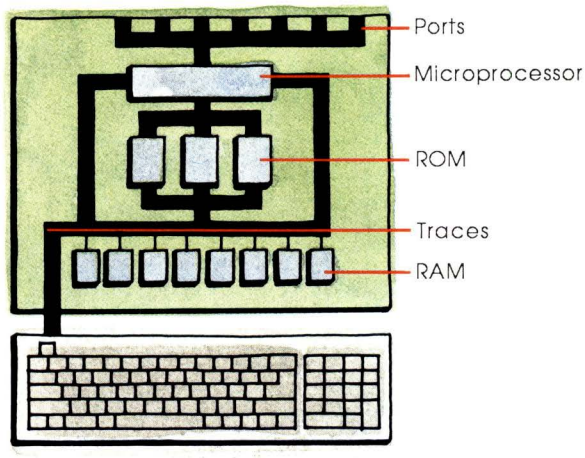


Figure 4-1
Main logic board

RAM and **ROM** (two kinds of memory you'll learn more about in a moment) and the microprocessor are **integrated circuits (ICs).** ICs are miniature electrical circuits etched into tiny rectangles of silicon. ICs reside in black plastic packages that look like mechanical centipedes. The centipede's "legs" are pins that connect the circuits to the **traces,** the electronic pathways through which the ICs communicate with each other. Both the IC and the IC package are referred to as a *chip.*

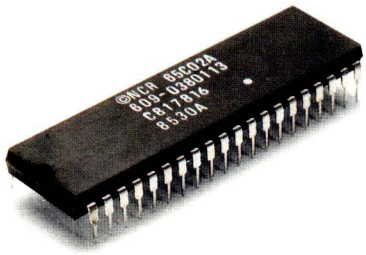


Figure 4-2
The microprocessor

The **microprocessor** is the computer's "brain." All of the other chips act to support it and it, in turn, supports their efforts. The microprocessor does the actual computing by executing the instructions given it by programs. See Figure 4-2.

RAM (for **random-access memory,** also known as *temporary, main,* or *working memory*) is the memory that holds, among other things, the program you're running and the things you create with the program. RAM is volatile; that is, when you turn the power off, all information in RAM disappears.

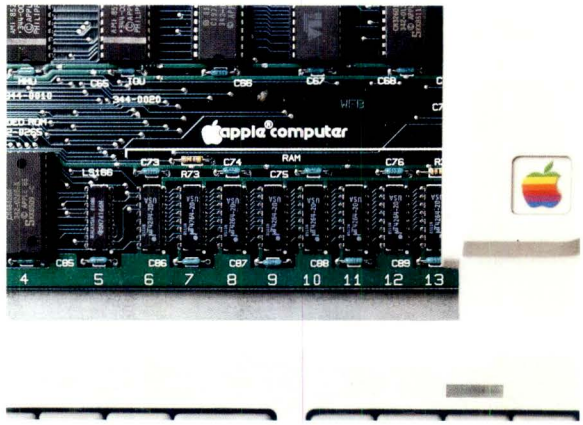


Figure 4-3
RAM chips

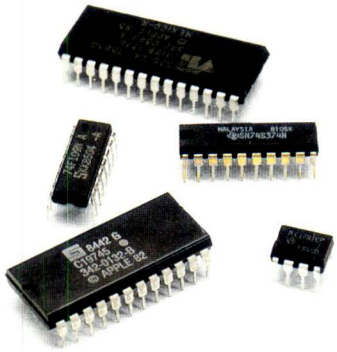


Figure 4-4
An assortment of ROM chips

ROM (for **read-only memory**), on the other hand, is permanent. ROM stores programs the computer uses to perform some of its tasks. The programs remain in ROM even when the power is off. Besides storing programs for operations within the computer, ROM also carries the Applesoft BASIC computer language. Figure 4-4 shows several different ROM chips.

In addition to the RAM, ROM, and the microprocessor, the main logic board bears custom ICs that interface, or handle communications, between the microprocessor and peripheral devices.

How it works

The best way to view the relationships among these parts is to look at what happens when you start the computer and run a program.

Starting the system

Starting a computer brings all the components into play. Every time you start your computer, a program in ROM looks for a disk with an *operating system* on it in the startup drive.

An **operating system** is a program that coordinates activities among the memory, keyboard, screen, and disk. It controls the way your program is loaded into memory, the way the computer works with data, the way data is stored on a disk, and the way the computer communicates with your printer and other peripheral devices. You'll find a more detailed discussion of operating systems near the end of this chapter.

Assuming the ROM program finds an operating system, the ROM program then copies the operating system into RAM. Once the operating system is in memory, you can load an **application program** (a program that applies the computer to some particular task, like word processing or cataloging data). Some applications are automatically loaded into RAM. In other cases, you must type a command to load the program. The loading process, governed by the operating system, takes a copy of the program on disk and loads it into RAM.

Retrieving data from a disk

Data is the general-purpose term for the numbers, words, and other information you enter into the computer. You can enter data by typing at the keyboard, loading a file from a disk, or using some other device (like a mouse, a graphics tablet, or another computer).

If you intend to work with a previously created file, you load the file's data into RAM by retrieving the **data** from the disk. The operating system loads a copy of the data into memory. For example, after loading a word processing program, you can then load in a letter you created in an earlier session. Once the letter is in RAM, you can see it on the screen. Different programs retrieve and save data in different ways. The important thing is that all offer the retrieve and save functions. See Figure 4-5.

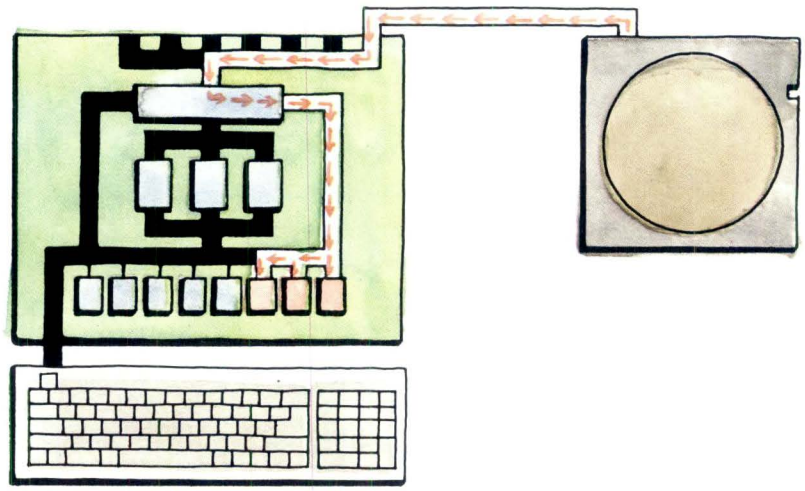


Figure 4-5
Retrieving a file from a disk

The process of loading the operating system, the program, and the data is like filling a vessel with three different liquids. Whatever amount of RAM remains unfilled is the amount available for you to add data. See Figure 4-6.

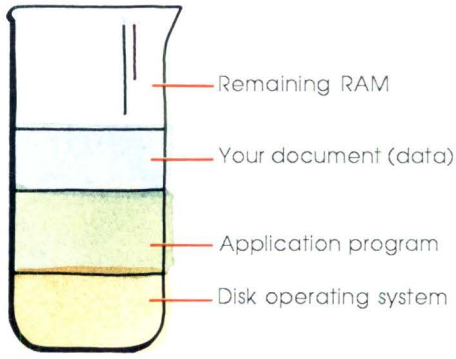


Figure 4-6
Filling up RAM

Interacting with the computer

For most people, the keyboard and the screen are the principal elements in computing. You press a key and the character you typed appears on the screen. Whether you are starting a new file or continuing work on an old file, the basic action is the same. The operating system reads the keystroke as a particular character. It assigns that character a place in RAM and then prints it on the screen. Figure 4-7 illustrates how the operating system, the application program, and your data share memory.

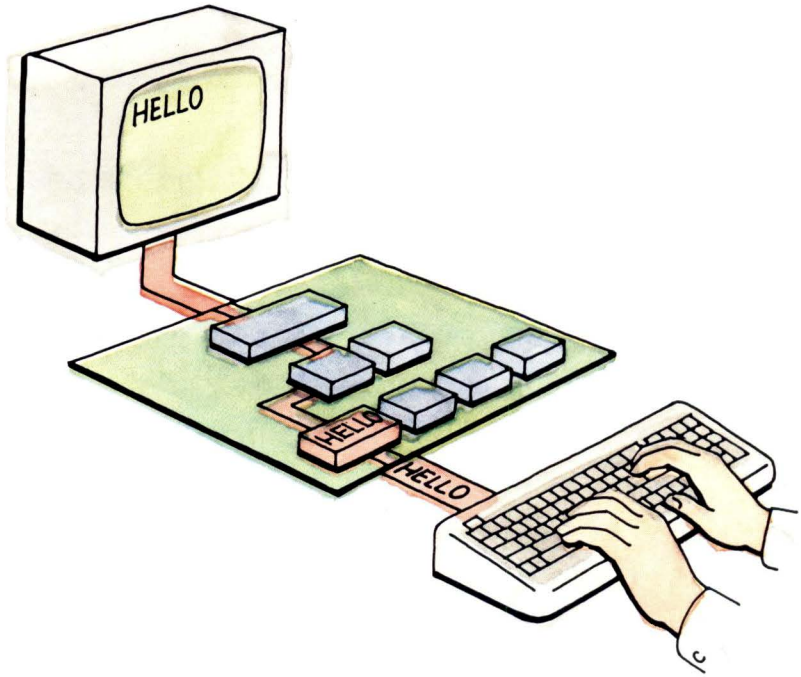


Figure 4-7
The keyboard, memory, and the screen

Because your computer's memory can hold more characters than your screen can show at one time, most applications **scroll** when you type more data than a screen can hold, or when you press arrow keys to see other parts of a document. When you scroll, your screen acts like a window, moving over the data area of RAM, so that you can see what you have stored in memory. Figure 4-8 illustrates scrolling.

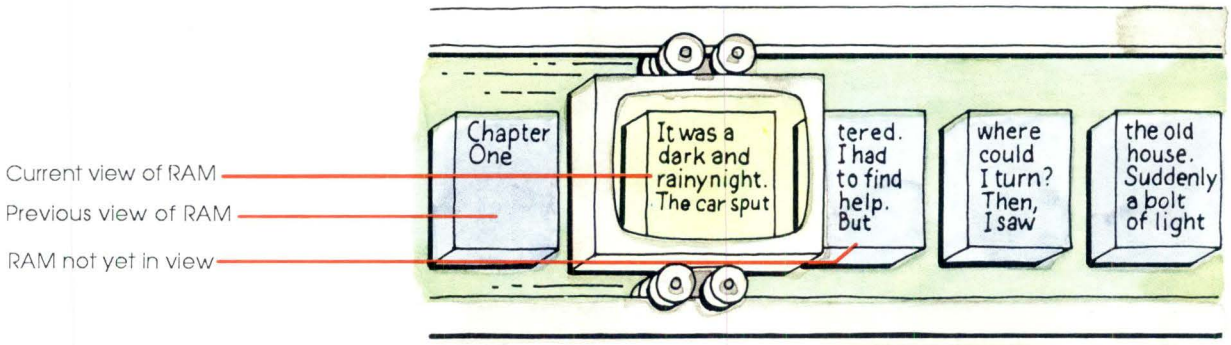


Figure 4-8
Scrolling a window on RAM

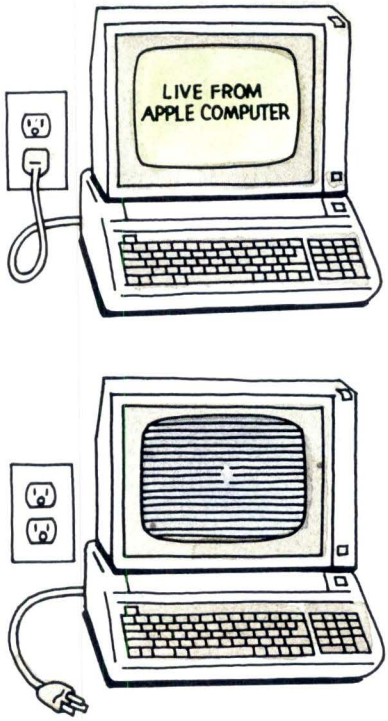


Figure 4-9
Memory is temporary

Saving information on a disk

What you see on the screen is only temporarily stored in the memory of the computer. It's not like a typewriter, where what you type appears on a page in a more or less permanent form. If something stops the flow of electicity to your computer, any data stored in RAM, but not saved on disk, is lost. The only way to recover lost data is to type it in again. See Figure 4-9.

- *Save early and save often:* No one likes to retype lost data. (A paragraph is okay, perhaps, but ten pages is out of the question!) Save a copy of your work on a disk at least every ten minutes or right after doing any complicated action. Many people also save just before doing a large-scale change on data, in case the change creates unwanted results. If you're working during an electrical storm, save more often.

When you save data in memory onto a disk, the program's Save command will ask you to name the new file. After you type a name, the program copies your data into a disk file. Every file must have a name, a **filename.**

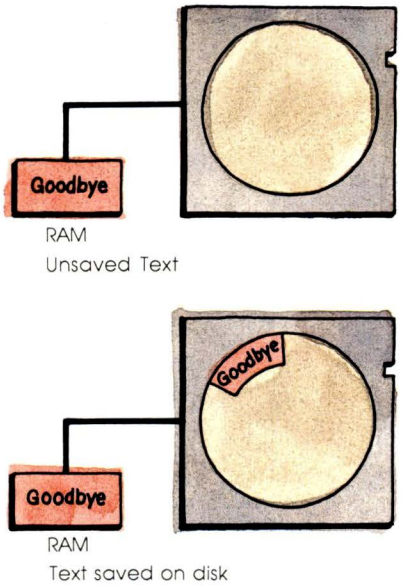


Figure 4-10
Saving information to a file on disk

Operating systems have rules for the maximum length of a filename, for valid first characters, and for characters that are invalid no matter where they appear in the name. The most common rule for a filename is that it must be unique on a particular disk or within a particular **subdirectory.** See Figure 4-10.

Once you've created a file, you can save changes to its contents with its current filename or with a new name. Saving a revised document under its original filename replaces the old contents of the file with the revised contents. If you save the revised information with a new filename, both the original version and the revised version are preserved on the disk in separate files.

Information stored on a disk is more stable than information stored in the memory of the computer. But because disks can be damaged, lost, or stolen, you should make at least one **backup copy** of any important file or data disk If your application program can't make copies, use the *System Utilities* disk to make backup copies of either entire disks or individual files.

- *Different-sized disks:* You can copy five 5.25-inch disks onto one 3.5-inch disk. However, if you need to back up information from a 3.5-inch drive to a 5.25-inch drive, do your copying by file or by groups of files.

From startup to backup

Figure 4-11 illustrates a typical session at the computer: starting up, creating information, saving the information on a disk, and making a backup copy of the disk file. Loading a file into memory, modifying the file, saving it, and backing it up follow a similar pattern.

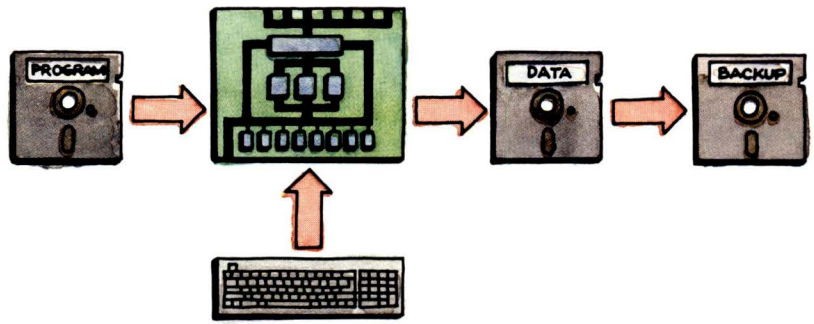


Figure 4-11
Using an application program

Operating systems

Each of the three Apple operating systems—ProDOS, DOS 3.3, and Pascal—formats disks in a different way. Therefore, you need to know which operating system an application uses when you perform any of three activities:

- Saving data to disk
- Formatting disks
- Working with other disk utilities

❖ *More operating systems:* If you add a co-processor to your computer, you may find yourself with yet another operating system. For example, the Z80® microprocessor runs the CP/M® operating system.

If your word processing program came on a ProDOS disk, you have to save your data on ProDOS-formatted data disks. If your data base program runs under the Pascal operating system, you have to save your data on Pascal-formatted data disks. You can't keep your word processing and data base data on the same disk unless the two programs use the same operating system.

The easiest way to avoid confusion is to write the name of the operating system on a disk's label when you format it. If compatibility of data between different application programs is important to you, make one of your software selection criteria a common operating system.

Chapter 4 summary

Main parts of the computer

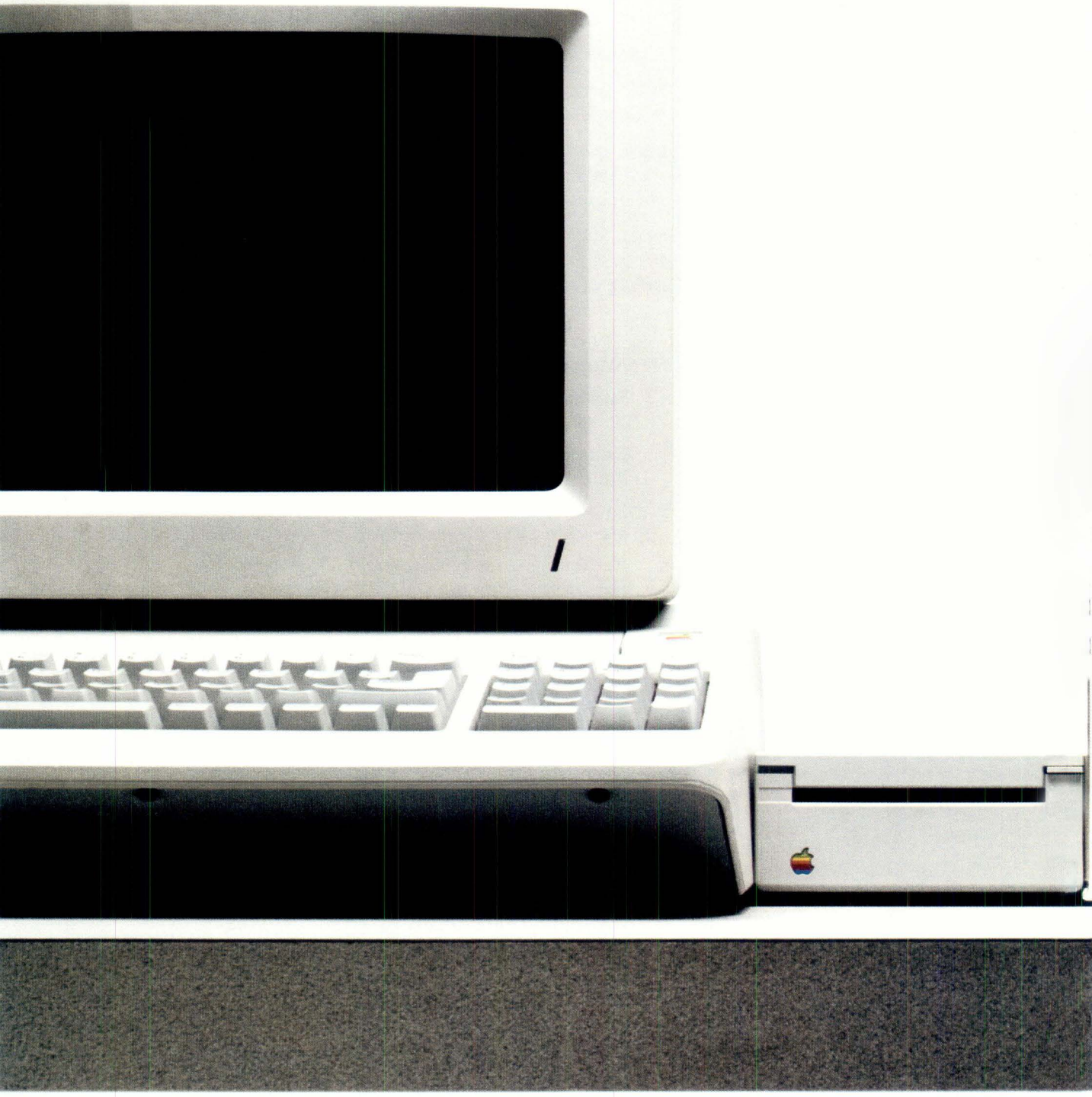
Microprocessor: Does the computing. Carries out the instructions in computer programs.

RAM: Short for **random-access memory.** This is where programs and data are stored temporarily. Whatever is in RAM is lost when power goes off.

ROM: Short for **read-only memory.** Permanent memory. Data stored in ROM does not disappear when power goes off. It contains, among other things, information the computer needs to get started.

Five easy pieces for computer

1. **Starting up:** Put a program disk in the startup drive and switch on the power.
2. **Creating information:** Type at the keyboard to create letters, budgets, charts.
3. **Saving information:** Name the information you've created and store it in a file on a disk for permanent storage.
4. **Retrieving information:** Load information from a file and change its contents.
5. **Backing up important files:** Copy a whole disk or individual files onto another disk.



Chapter 5

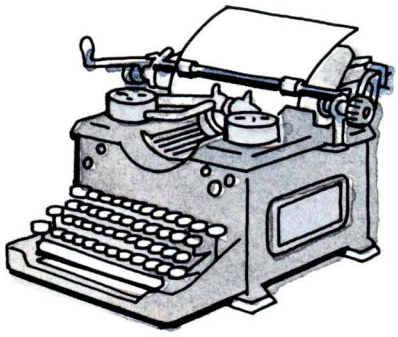
Software



This chapter presents a software banquet—a category-by-category discussion of the many kinds of programs available for Apple computers. If you have ever asked yourself, "What can I do with an Apple?" you can find the answer here. Write memos, letters, reports, or books. Prepare budgets and forecasts, and graph the figures to get the picture. Keep personnel records, address lists, or catalog your record collection. Learn touch typing, play games, or write your own programs. And that's just the beginning.

Software, the programs you load into your computer, can transform your computer from a teacher to a bookkeeper to a programming tool. Programs designed for a particular purpose or application are called **application programs.** You can buy programs or write your own. This chapter gives brief overviews of the following software categories.

- Word processors
- Data bases
- Spreadsheets
- Graphics
- Integrated software
- Education
- Entertainment
- Communications
- Home finance
- Accounting
- Special interest software
- Utilities
- Computer languages



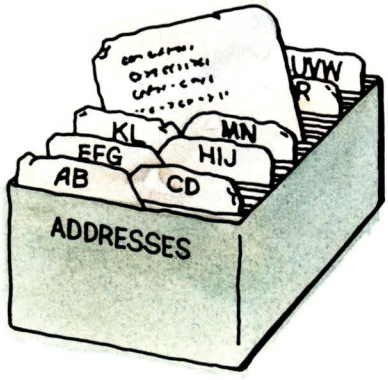
Word processors

A **word processor,** or *word processing program,* makes writing and rewriting easy. As a result, you can write more quickly; and because a word processing program makes changes easy, you'll probably find yourself becoming more creative.

With a word processing program, you can

- Change individual characters, words, and sentences without retyping those parts of the document that haven't changed.
- Delete words and sentences. (The document rearranges to fill in the gaps.)
- Move paragraphs around to improve a document's organization.
- Change the margins of your document (even after you've written it) to make a sharper presentation or to change the number of pages.
- Store standard blocks of text on disk and merge them into documents as you write.

Some word processors come with companion programs that check and correct your spelling. Other programs that work directly with word processors include thesaurus programs, picture libraries (a type of graphics program), and grammar checkers.



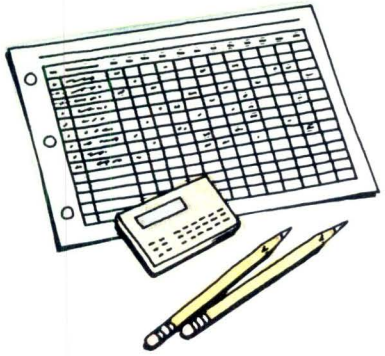
Data bases

Data base programs (also known as *data managers*) keep track of lists of information: mailing lists, client information, inventories, addresses, phone numbers, test results, collections (books, records, butterfiies), itineraries, medical and dental records—any information you now store on forms or index cards.

The value of a data base program lies in the fact that you can manipulate information stored in a data base. You can store data in a particular order—alphabetically, by most recent date, by largest account balance—and have the program change the order as the need arises.

You can also retrieve information based on specific criteria—like a part number, a range of dates, or city of residence. You can also have the data base program do cross-references to produce lists—all customers who placed orders last month or all students who scored 100% on at least one test. Anything you can retrieve, you can print in neatly formatted reports.

Business data bases keep track of customer records and inventory. You can set up data bases at home to catalog your valuables or your bubblegum card collection. You can also keep club membership records, statistics on a sports team, or favorite recipes.

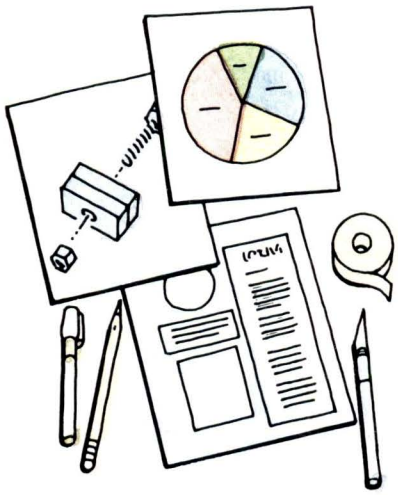


Spreadsheets

With the traditional spreadsheet, you write out figures in pencil on a columnar pad (like ledger paper). Then, with a calculator, you work out forecasts, budgets, or other figures. If any number changes or if you want to try a different strategy, you find yourself with a lot of recalculating, erasing, and rewriting.

When composing an electronic **spreadsheet,** you still have to put data in columns and rows, and enter formulas (just as you do on a calculator). But when you try different strategies, the spreadsheet program does all the recalculating for you. All you do is change the data (or formulas) to create new scenarios. Spreadsheet programs take the drudgery out of financial planning and leave you more time for creative thinking.

- *Template:* If you don't want to work out formulas for a project, you can get template files on disk. A template is a spreadsheet file with formulas and labels in place. All you do is type in your own data. Templates are available for numerous tasks, such as taxes, depreciation, and accounts receivable.

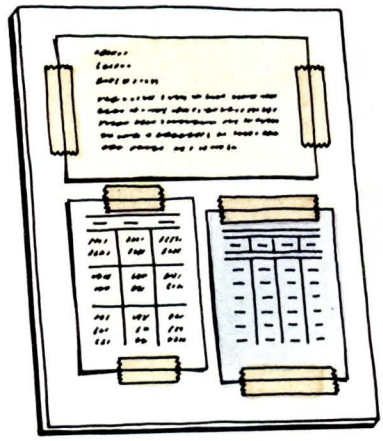


Graphics

Business graphics programs convert numerical information—monthly forecasts, regional figures, departmental budgets—into presentation-quality bar, line, pie, and scatter graphs. Graphics generated with your computer can enhance presentations and aid in business decisions. Most business graphics programs are designed to receive spreadsheet and data base files, so you don't have to retype numbers and labels. You just transfer the data to the graphics program and view the results.

An artistically oriented graphics program is to an artist what a word processor is to a writer—it encourages you to try a variety of approaches before you commit a drawing to a paper. Some graphics programs come with a disk full of drawings with which you can create greeting cards, signs, banners, or pictures.

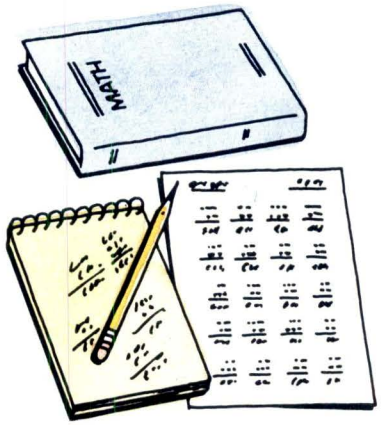
With **desktop publishing** software, you can lay out newsletters, catalogs, or newspaper pages—complete with different type styles, adjustable column widths, lines, and bars.



Integrated software

Integrated software is a group of application programs designed to work together and share data. A typical integrated software package includes word processing, data base, and spreadsheet programs. With integrated software, you can combine information created with different applications into one document. For example, you can write a report with a word processing program and then add a statistics section from a data base and a budget section from a spreadsheet program.

Another advantage of integrated software is that the commands you learn for one application (like word processing) work similarly in the package's other applications. This shortens learning time and enhances productivity.

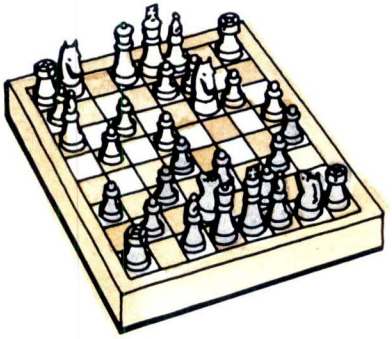


Educational software

Programs that teach are called **educational software,** or *courseware.* Good educational software teaches at the student's speed in an interactive, entertaining way. Software for children includes pre-school concept-building exercises and elementary arithmetic and alphabet drills. You can find educational software for all disciplines at all grade levels. For example, high school students can benefit from programs that prepare them for college entrance exams. Students and working adults can get programs that tutor them in foreign languages.

See your authorized Apple dealer for popular packages. Also, visit your local library and look through the **software directories** that describe and rate Apple software There are more than 3000 educational programs available for the Apple II family of computers.

Teachers who want to write their own courseware or **CAI** (**C**omputer-**A**ided **I**nstruction) software can use a programming language designed for educators called **PILOT** (acronym for **P**rogrammed **I**nquiry, **L**earning, **O**r **T**eaching). Apple's version of PILOT is **SuperPILOT™**.

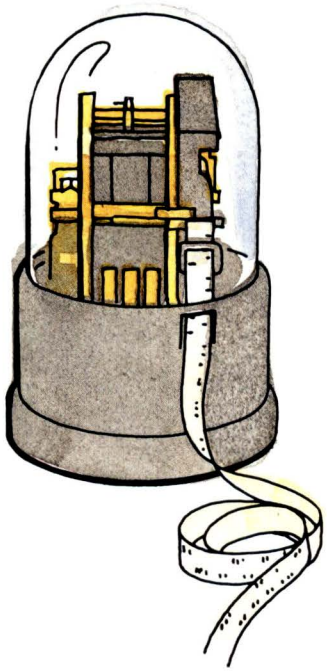


Entertainment

An incredible assortment of games is available for Apple computers. You can enjoy simulations of your favorite non-computer games like chess, checkers, backgammon, bridge, blackjack, and poker. Or try games created for computer like adventure games—sophisticated **simulations** that put you in a dungeon or on a remote island and challenge you to find the hidden treasure while avoiding monsters, booby traps, and other pitfalls. Become a private eye, a pro football coach, a stockbroker, or defend Earth from alien invaders.

Communications software

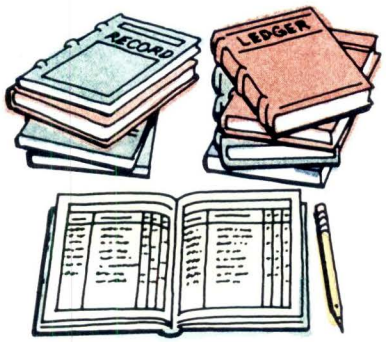
A *modem* is a device that adapts or modulates computer signals so they can be sent to other computers over the phone lines. *Modem* is a contraction of the term *modulator/demodulator.* Chapter 6 discusses modems.



With a telephone connection, **communications software,** and a **modem,** you can exchange information with other computers and take advantage of information services. With good software, you can have the modem dial a number from a menu of numbers, send, retrieve, and save files.

With communications software and a modem, you can

- Access hundreds of data bases (called **information services**), each with a library's worth of information.
- Exchange mail or busines data with colleagues (who are similarly equipped with a computer, communications software, and a modem).
- Transfer information between computers that would otherwise be incompatible.
- Bank by phone.
- Get information from the office's main computer while you work at home or on the road.
- Get the latest stock market quotations.
- Get up-to-the-minute news from major wire services.
- Read business newsletters.
- Shop by phone.
- Receive **public domain software** from a computer **bulletin board system (BBS).**
- Communicate with other computers in the same room.



Accounting software

Accounting software handles all the standard books—general ledger, accounts receivable, accounts payable, payroll, inventory—but with much greater speed, accuracy, and control. The increased speed and accuracy mean you can get financial reports as you need them, instead of waiting for monthly or quarterly reports from your accountant.

A good accounting program can help you improve your cash flow management, boost your collection rate, plan payments to take advantage of vendor discounts, maintain inventory levels that minimize cash investment, and improve customer service.

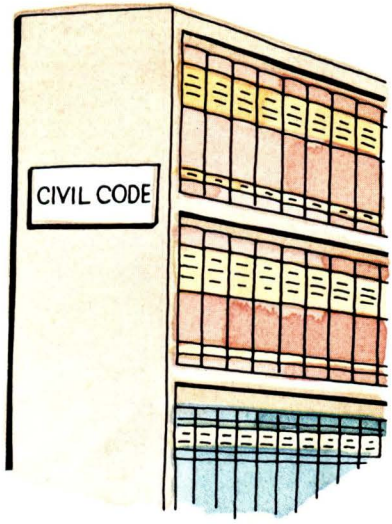
Most accounting software packages are designed around a general ledger. The other modules (accounts receivable, for example) work with the general ledger for automated posting. This modular approach allows smaller businesses to start with a general ledger package and add additional modules as needed.



Home finance

Home finance programs let you play "what if" with your home budget the same way electronic spreadsheet programs let financial planners play "what if" with their multi-million-dollar corporate budgets. Here are some of the things you can do with a home finance program:

- Keep track of expenses and balance your checkbook.
- Prepare budgets.
- Figure out mortgage payments and depreciation on your house.
- Keep track of tax and auto records.
- Evaluate repayment schedules on a new home or car.
- Weigh the relative merits of money market, T-bill, stock market, and other investments.

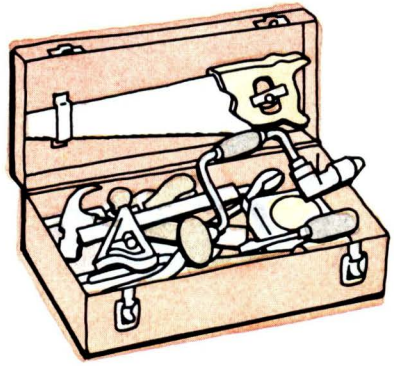


Special interest software

Special interest software, also called *vertical market software,* is software that caters to a particular audience or profession. It's more expensive than general-purpose software, but much cheaper than hiring a programmer to write software from scratch.

Lawyers can find programs that handle billing, help with research, and keep track of court appearances and filing dates. Medical offices can get data base software customized to deal with patient histories, to help diagnose illnesses, and to match allergy symptoms to causes. Other medical software handles billing and helps process insurance claims.

You can find programs for process control, scientific measurement and analysis, insurance underwriting, composing music, and virtually any area where a specialized need for calculating or data handling exists. Vertical market software isn't always listed in software catalogs; check software ads in professional journals and attend computer seminars sponsored by your professional organization. The American Bar Association, for example, has a Committee on Computers that sponsors **user groups** (computer clubs) for lawyers and promotes conferences and seminars on the use of computers in the legal profession.



Utilities

Utilities are programs that perform special tasks on disks and files. Some utilities are strictly for programmers. Others are of interest to applications users. For example, utilities can

- Find bad disk sectors and mark them off, so programs won't use them.
- Recover deleted or damaged files.
- Give you dozens of new typefaces to use with your printer.
- Redefine keys to perform special functions.



Computer languages

With Applesoft built into your computer and a copy of *A Touch of Applesoft BASIC* to get you going, BASIC represents a good starting point for learning to program. And it may be all you ever need. If you develop an interest in another language, rest assured that you can find numerous popular languages (and a number of obscure ones) implemented for the Apple II computers. For example:

Pascal: Invented as a language to teach programming, Pascal has become popular for its clean structure and readable instructions.

Logo: Although created to teach children problem-solving techniques, adults enjoy it too. Great graphics.

PILOT: A language with which teachers can write their own courseware.

Fortran: An engineering and scientific language.

COBOL: Principally a language for writing business systems.

C: A popular language with professional programmers.

FORTH: Another language enjoyed by professionals.

Modula-2: A new language seen as an improvement to Pascal.

LISP: The premier language of the artificial intelligence community.

Assembly language: The microprocessor's own instruction set—used for maximum execution speed and greater access to the computer itself.

Choosing programs

Before you buy a particular application program, do the same kind of research you do when you invest in a car, a TV set, or a stereo. Read reviews in computer magazines and talk with people who use the kind of software you're interested in. (User groups are a wealth of information when it comes to "real life" with a particular program.) If at all possible, try out software before you buy it. Keep these questions in mind when shopping for software:

- Does the program do what you want to do? A lot more or a lot less? For example, if you only want to write letters, there's no point in spending the time and money on a word processing program that has a number of advanced features you will never use. On the other hand, if you need to do complex document formatting—varying margins, numeric columns, footnotes—save yourself time and frustration and buy a more powerful product.
- What do you get for your money? Compare features and price. What are you paying for features you may never use?
- Given the complexity of a particular program, is it easy to control? Or do you feel that you have to fight the program to get the job done?
- What is the software publisher's upgrade policy? How much does the publisher charge for new releases? Some charge a lot, others very little.
- What is the software publisher's support policy? Does the publisher have a user hotline to answer technical questions? Speaking of support, if you're looking at a complex piece of software, check your local bookstores for books that can help you develop the program's full potential.

- Will the program work with your current system? Or will you have to buy an extra card or peripheral device or more memory to use the program effectively? If you have a hard disk, can you copy the program onto your hard disk, or will it start only from a 5.25-inch or 3.5-inch disk drive?
- If computers are a form of communication between you and your clients, is the business software you're considering buying compatible with that your clients use?

If you have a task in mind, but don't know the type of program that can handle it, talk to your dealer. Check software directories in your local library, or check industry-related journals for articles and advertisements.

There are thousands of programs for the Apple II family of computers—some from Apple, but most from independent software developers. Ask your authorized Apple dealer to help you choose the software that best meets your needs. Also, see Chapter 7 for information on resources.

Chapter 5 summary

An application program has a particular purpose, such as budgeting, financial planning, or cataloging a collection. Utility programs work with disks and files. Some modify the way the computer behaves. Computer languages are programs with which you write other programs.

Popular software

Word processors: Write letters, reports, books.

Data bases: Keep track of lists (addresses, inventories, collections).

Spreadsheets: Play "what if" with budgets, financial planning, and other business numbers.

Graphics: Create graphs, drawings, page layouts.

Integrated software: Create and share information with a collection of programs (usually word processing, data base, and spreadsheet).

Education: Learn or teach a variety of subjects.

Entertainment: Have fun (and sometimes learn, too).

Communications: Exchange information with other computers and computer services by phone.

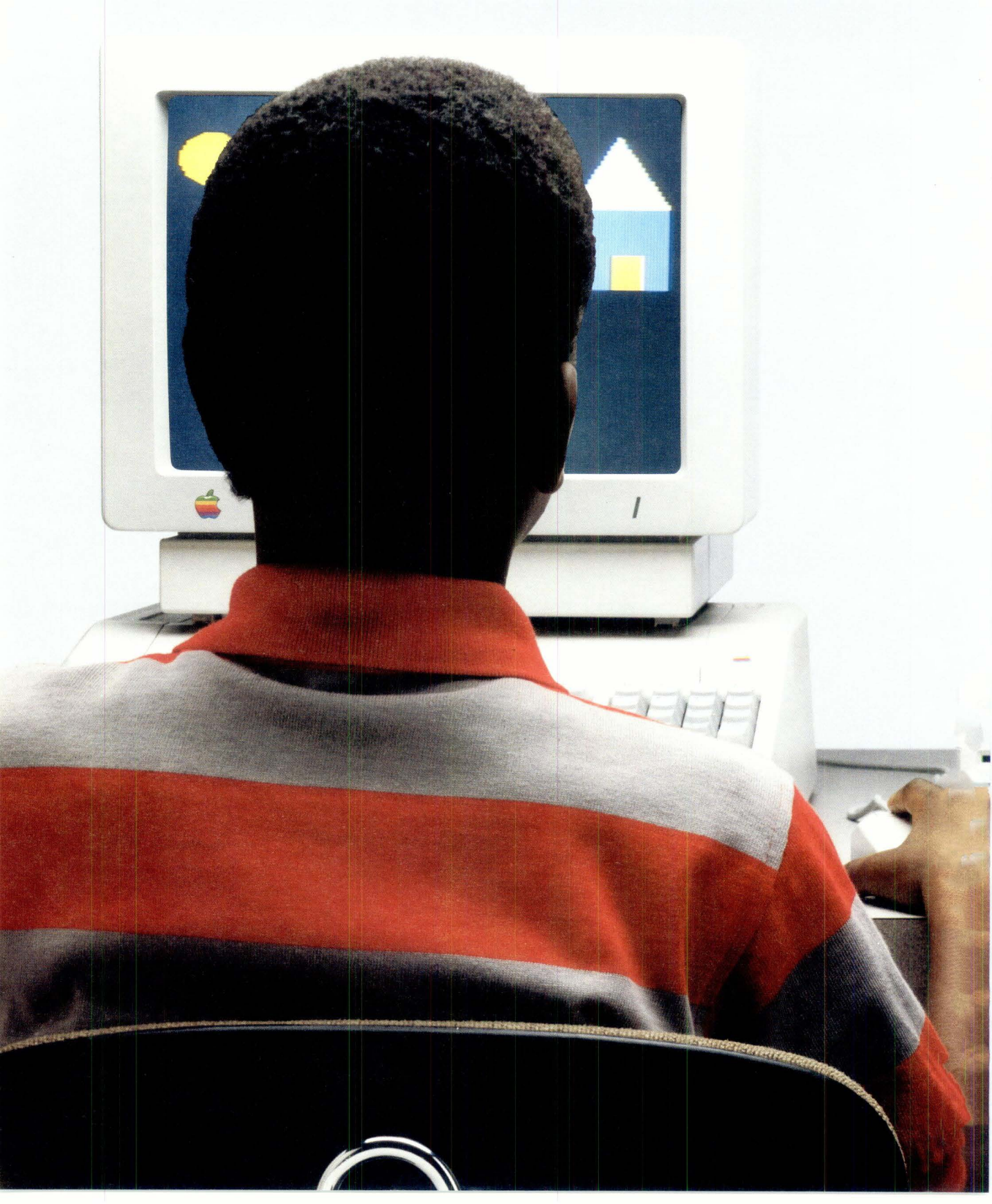
Home finance: Track expenses, maintain budgets, manage portfolios and plan your taxes.

Accounting: Automate accounting functions like general ledger, accounts receivable, accounts payable, payroll, and inventory.

Special interest software: Work with programs designed for a particular profession (medicine, law, farming).

Utilities: Do disk and file repairs and modify the computer.

Computer languages: Create your own programs.



Chapter 6

Peripheral Devices



You can find dozens of peripheral devices to make your computer more useful and fun. This chapter describes the most popular peripheral devices and a few unusual ones, too. The survey includes

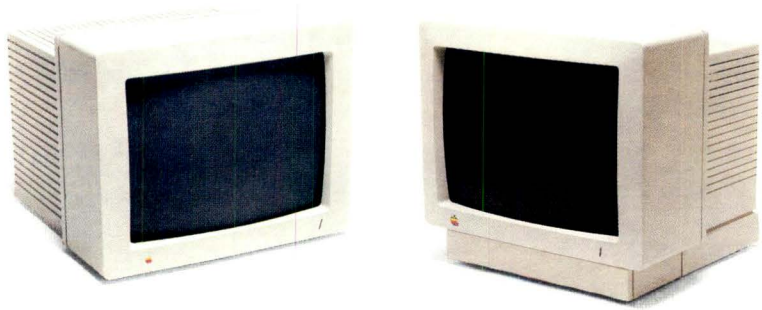
- Monitors
- Printers
- Plotters
- Disk drives
- Mouse devices
- Joysticks and hand controls
- Graphics tablets
- Video digitizers
- Modems
- Additional memory
- Co-processors
- Other devices

Monitors

Composite and *RGB* define the contents of the signal the computer sends to the monitor. **Composite color monitors** decode a single (composite) signal. **RGB monitors** receive and use separate signals for red, green, and blue.

The two most common types of monitors are monochrome monitors and **composite** color monitors. Most **monochrome monitors** project characters (and graphics) on a black background. Characters can be white, green, or amber.

Color monitors cost more than monochrome monitors, but they're ideal for computer graphics and for displaying business charts and graphs. Some color monitors don't have sharp text displays. Others have a Color to Monochrome switch; when you set the switch to monochrome, the monitor displays crisp, clear text. The test is to display text on a color monitor before you buy. Is the image up to your standards?



Typical monitors

RGB color monitors produce a sharper picture and better color reproduction than composite color monitors. However, they require an interface device (monochrome and composite color don't).

You can connect a television set to an Apple computer through a radio-frequency (RF) modulator, but if you plan to use your computer with a TV set for word processing, financial planning, or other business applications, make sure the programs you buy can generate a 40-column display. (Check with your dealer or with the software's publisher.) A standard television set can't display 80 characters per line clearly, the way monitors can.

- *TV/monitor combinations:* You can find television sets that have a built-in video input jack and switch for changing from TV to computer (or other video device). When switched to the "computer" position, these sets give the same kind of crisp, 80-column display as a regular monitor. You don't need an RF modulator for these sets. Just connect them through the video jack as you would a monitor.

Printers

A **printer** prints on paper the information created with a computer. You can use a computer without a printer, but for most people, a printer is a must. Printers range in price from a few hundred dollars to thousands of dollars and vary accordingly in print speed, print quality, and noise. The most common types of printers are *dot matrix, daisy wheel, thermal transfer, ink jet,* and *laser.*

```
This is what you get with a dot matrix printer.

This is what you get with a daisy wheel printer.

This is what you get with a thermal printer.
```

This is what you get with a laser printer.

Print samples (ink jet not shown)

Dot matrix printers

Dot matrix printers form characters with patterns of dots. They're fast, economical, ideal for graphics, and fine for drafts, memos, and personal letters. Because of the way they form characters, dot matrix printers can produce a wide variety of type sizes, typefaces, and graphics—so you can create headlines and other special effects. When equipped with a color ribbon, some dot matrix printers print words and graphics in color.

When shopping for a printer, look closely at printouts. If you can see the dots that make up each character, you might not want the printer for professional use (except, perhaps, for preliminary drafts). The text produced by a good dot matrix printer, however, can be almost indistinguishable from text produced by a typewriter or a daisy wheel printer. The final choice depends on your needs.

Daisy wheel printers

Daisy wheel printers, also known as *letter quality printers,* are essentially high-speed, high-quality typewriters. They are much slower and more expensive than dot matrix or thermal transfer printers, but if you want your work to look as if it was produced on a high-quality typewriter, you may need a daisy wheel printer. Most daisy wheel printers use a circular print wheel (that looks something like a daisy) to type characters.

Thermal transfer printers

Thermal transfer printers "burn" characters onto paper. They are inexpensive and quiet. The print quality varies dramatically among different kinds of thermal printers. Some are good enough for correspondence; others are suitable only for drafts and interoffice memos. Most thermal printers require either specially treated paper or specially treated ribbon. Check the prices of these accessories before buying a thermal printer. Accessories can make a thermal printer fairly expensive in the long run.

Ink jet printers

Ink jet printers have a tiny ink cartridge that squirts points of ink on paper. Ink jets are exceedingly quiet and reasonably fast. The ink cartridge and print head are one unit, so when you run out of ink, you replace the whole unit. Because of the liquid ink, characters tend to blur slightly on ordinary computer paper. Be prepared to buy special paper.

Laser printers

Laser printers have opened a whole new realm for the printed word and graphics—desktop publishing. They produce near-typeset-quality documents. People are now publishing newsletters, books, and even weekly newspapers on laser printers without a trip to an art studio or a typesetter. Although laser printers are the most expensive, they remain unmatched for print quality and are reasonably fast.

Choosing a printer

Whether you decide on a thermal transfer, dot matrix, or daisy wheel printer, make sure the one you buy works with your computer. Ask for a demonstration, preferably with the programs you plan to use.

Also, consider the type of paper you'll use. With most printers, you can switch between pin-feed paper and single-sheet paper. The advantage of **pin-feed paper,** which comes in a stack of attached, perforated sheets, is that you can leave the printer unattended while long documents print. (Some printers require an additional attachment to use pin-feed paper.)

Many people need single-sheet paper capability for printing on company letterhead or personal stationery. If you plan to print long documents frequently on single sheets of paper, choose a printer that takes a **single-sheet feeder,** a device that can feed single sheets of paper to the printer.

Serial or parallel interface

When you're shopping for printers, you have a choice between two device interfaces: **serial interface** and **parallel interface.** These terms refer to the way information is sent from the computer to the printer. With serial printers, the computer sends information one **bit** at a time. With parallel printers, the computer sends information eight bits at a time. Don't let speed alone dictate your choice between a serial or a parallel printer. Both modes of transmission are faster than most printers can print.

A *bit* (for *binary digit*) is the smallest unit of data measurement. In Apple computers, one byte comprises eight bits. A bit is either on or off, a 1 or a 0.

- *Apple IIe owners:* Find the printer you want, and then get the appropriate interface card to connect it to your computer. If you get a serial printer, get a serial interface card. If you get a parallel printer, get a parallel interface card. (Don't assume that the interface card comes with the printer.)
- *Apple IIc owners:* The Apple IIc has a built-in serial port. If you need to connect a parallel peripheral device, you must also get a serial-to-parallel converter device. See your authorized Apple dealer for details.

Plotters

A **plotter** is a peripheral device that uses pens to draw detailed graphics on paper. You can do business graphics on plotters or plot engineering and scientific data. Simple plotters have only one pen. More complex plotters can have as many as eight pens. Because you can change pens, you have a wide variety of colors at your disposal.



A plotter graph



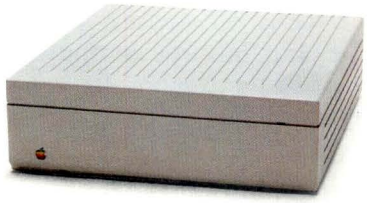
A 3.5-inch disk drive
and a 5.25-inch disk drive

Disk drives

One **disk drive** is a must. A second disk drive is a convenience for some and a necessity for others. (Some programs require you to have two disk drives.) Many people like to run an application program disk in drive 1 and store the application's data on a disk in drive 2. Having two disk drives also makes copying files and disks easier and faster.

Apple offers two types of disk drives: those that take 5.25-inch disks and those that take 3.5-inch disks. The 3.5-inch disk is a newer development and can hold over 800,000 characters. The 5.25-inch disk holds over 143,000 characters.

If you plan to run large data bases, accounting software, or other applications that involve large amounts of data, you should invest in a **hard disk.** A hard disk can store the same amount of information as dozens of floppy disks. A hard disk is a fast, convenient way to handle data. You'll find that operations like loading and saving data take a fraction of the time taken by floppy disks.



A hard disk



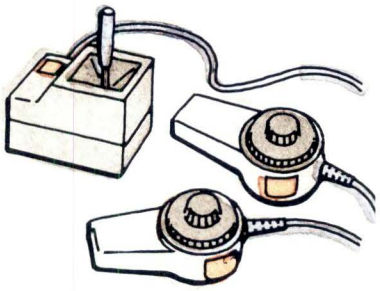
A mouse

Mouse devices

A **mouse** is a device with which you can give commands without pressing keys. When you move the mouse across a desk top, a **pointer** (often a little arrow or I-beam) moves in a corresponding manner across the screen. By moving the mouse and clicking the **mouse button** at appropriate times, you can move text within a document, select from lists, and create drawings. A mouse works only with software designed to take mouse commands.

Most mouse-driven programs offer you choices through **pull-down menus.** Such programs usually have a **menu bar** across the top of the display. Hidden inside the bar are menus (lists of options). To see the pull-down menu, you point to one of the menu titles on the menu bar and press the mouse button. Some programs don't have a menu bar, but still respond to a mouse. The manual accompanying any **mouse-driven program** should provide details for using the mouse.

Joysticks and hand controls



A joystick and game paddles

If you plan to plan to play arcade games, you'll need a joystick or hand controls. The majority of arcade games require such a device.

Joysticks and **hand controls** (including *game paddles* and *track balls*) control the movement of creatures or objects in many game programs. A joystick is a movable lever similar to the kind of control found in airplanes. With game paddles, you control movement by turning a knob. With a track ball, you roll a ball (mounted in a base) with the palm of your hand. All these devices have buttons you press to do things like fire torpedoes or throw forward passes.

Modems

A **modem,** short for *modulator/demodulator,* links your computer by telephone to other computers and information services. If you plan to exchange data with your company's **mainframe computer,** to use an information service for stock market quotations, for research, or for electronic banking, you'll need a modem and a communications program.

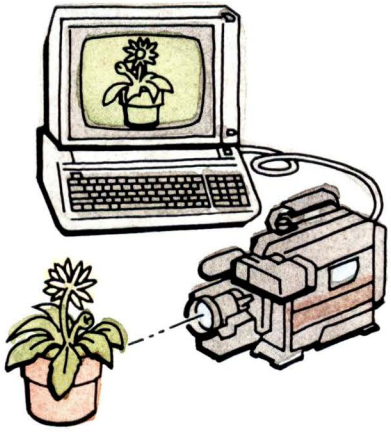
Baud is a unit of data transmission speed—the number of signal events per second. Baud is sometimes equivalent to *bits per second.*

Different modems send and receive information at different transmission speeds, or **baud.** The most popular Apple modems transmit 300 baud, 1200 baud, or 300/1200 baud (both rates available). Modems that transmit at 1200 baud cost more, but they're four times faster than 300-baud modems—a valid consideration if you're paying long-distance phone rates. Modems with higher bauds (2400, 4800, 9600, 19,200) are also available.

When two computers communicate, they must transmit at the same baud. If you need to communicate with a computer that works only at 300 baud, but you want higher-speed communications, choose a modem that you can switch between 300 and 1200 baud.



A modem



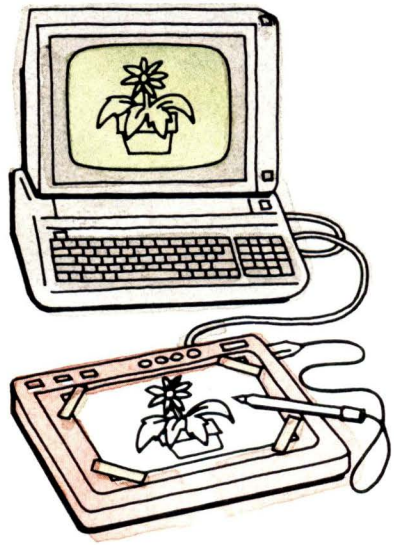
A video digitizer

Video digitizers

A **video digitizer** is a device that converts images into a digital form that the computer can store and display. Many digitizers look like small video cameras, and in a sense they are. But instead of recording an image on tape, they record the image in the computer's memory, where you can modify the image and store it on disk. Other digitizers can scan printed material—magazine pages, photographs, drawings—and convert them to digital form for editing and storing on disk.

Additional memory

Many users find themselves creating larger documents than they expected or buying powerful applications that demand more memory. To ensure that your computer can handle these demands, Apple has engineered its computers so you can add memory up to one megabyte (in 256K increments). Some programs can run faster when extra memory is available.



A graphics tablet

Graphics tablets

A **graphics tablet** is an electronically sensitive tablet that connects to the computer. As you draw on the tablet (with a stylus or other device), your work appears on the screen. Most graphics tablets contain a palette of colors that you can work into your creation. Work created with a graphics tablet can be saved on disk and printed.

Co-processors

A **co-processor** is a microprocessor that works with or overrides the computer's own microprocessor. A co-processor can take advantage of software developed for other computers—software that wouldn't otherwise work on an Apple computer.

The most popular co-processor for the Apple is the **Z80,** which runs programs based on the **CP/M** operating system. By installing a Z80 device, you can select from over 20,000 CP/M-based programs, many of them free (public domain programs). You can also find co-processors that run **MS-DOS**™–based programs. Other co-processors increase computing speed or enhance graphics.

Other devices

You might also be interested in some of the less common peripherals available for the Apple II family of computers:

Clock device: Makes it possible for programs to record the date and time a file was last revised. With a clock device and home control devices, you can program the computer to turn lights and appliances on and off. With a modem, clock device, and communications software, you can have the computer dial an information service when rates are low.

Accelerator device: Makes most programs run almost four times faster than normal. It's especially useful for spreadsheet and other number-crunching applications.

Print buffer card: Gives the printer its own RAM memory, so you can send an entire file to your printer at one time and use your computer for other things while the file prints out. Some buffer devices plug into the computer; others into the printer itself.

Voice input device: Accepts voice commands and translates them into a form the computer can respond to.

Music synthesizer: Simulates a variety of musical instruments You can compose and orchestrate music with special software.

Home control device: Controls the room temperature, turns lights and appliances on and off, or monitors an alarm system.

For more information on peripheral devices, see your authorized Apple dealer. Also, read the ads and hardware reviews in computer magazines and look through Apple product directories (at your dealer, libraries, and bookstores).

Chapter 6 summary

Popular peripheral devices

Monitors: Display your interactions with the Apple.

Printers: Print a paper copy of information you create with the computer.

Plotters: Draw a paper copy of the graphics you create with the computer.

Disk drives: Store and retrieve information including programs and data.

Hard disks: Store the equivalent of dozens of floppy disks.

Mouse devices: Create graphics, select from lists, move blocks of data by pointing and clicking.

Joysticks and hand controls: Move objects and creatures around the screen.

Graphics tablets: Draw your own designs on a tablet. You can view your work on the screen and save it on disk.

Video digitizers: Transform images so that you can store and edit them.

Modems: Link your computer to other computers and information services by phone.

Additional memory: Adds additional RAM memory.

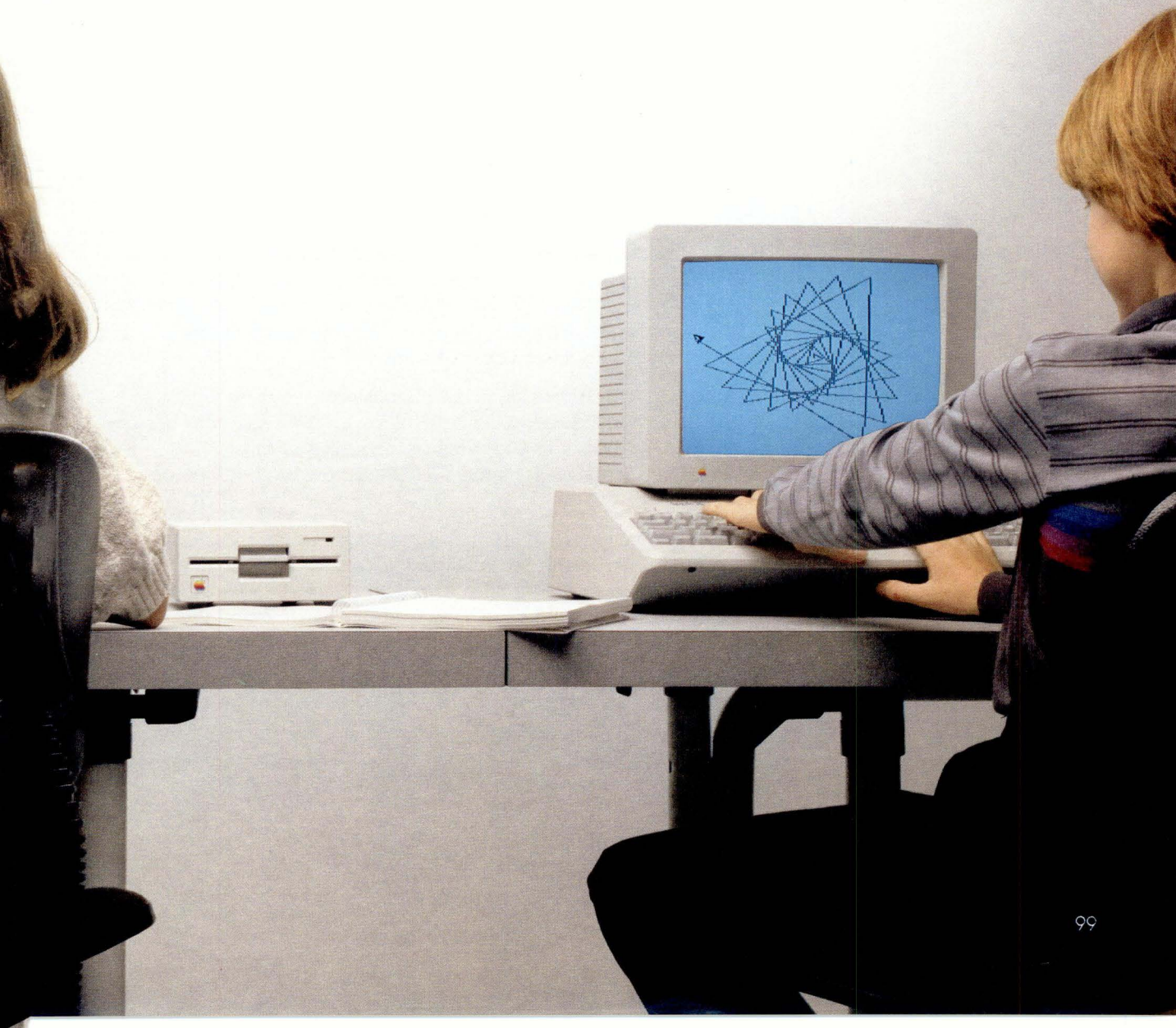
Co-processors: Add an extra microprocessor to take advantage of other operating systems and software.

Other devices: Hardware for everything from clocks to process control.



Chapter 7

Resources



Buying a new computer, software, and a peripheral device or two is just the beginning of a wonderful adventure. As you work, you will probably want to know more: How can I use my word processor more effectively? How can I set up my data base to handle my accounts receivable? Where do I find out about new hardware? Are there any new adventure games with color graphics? How would I go about doing serious programming in Logo? Does anyone know how to . . . ?

All such questions call for resources. Resources in computing include books and magazines, other users, and telecommunication with other computers (and users).

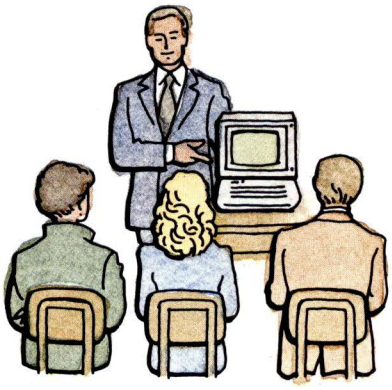


Books and periodicals

Books about computers, applications, and programming abound. The range of depth in all topics runs from the books for the absolute beginner through books for the experienced professional user. The applications books can point you to procedures that will bring greater productivity from your software.

The best sources for books include bookstores, your public library, and your authorized Apple dealer. So look around. Ask your dealer to recommend books in your area of interest. And most importantly, spend a few minutes reading through a book before you buy it.

Computer magazines are another good source of information about software and hardware. Some magazines are for general audiences. Some are devoted to particular computers, including the Apple. Besides articles, you'll find reviews and lots of advertisements.



User groups

Interacting with other Apple computer owners in a user group is both fun and a great way to learn more about your Apple, the applications you're using, and new products. Members who have spent a lot of time with a particular program or piece of hardware can cut your learning time in half by helping you solve problems and showing you shortcuts.

Plus, most user groups feature demonstrations of new products at their meetings. Joining a user group can save you money, too. Most maintain a library of free software, much of it written by members of the group.

Many groups also include special interest groups (SIGs) in their activities. You'll find a SIG for just about any area of interest—working with a particular program, programming in a particular language, investing, accounting, engineering, and so on.

Ask your dealer for the Apple user group nearest you or call (800) 538-9696, ext. 500 (U.S. only).

On-line resources

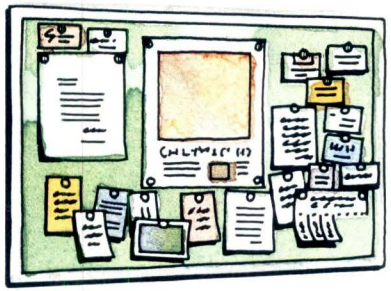
If you have a modem and communications software, you can communicate electronically with other users and take advantage of a number of electronically stored information and programs. Two major on-line resources are the commercial information services and local electronic bulletin boards. An **on-line** resource is a resource your computer can reach through data communications. (*Off-line* resources include services that provide disks of information, like stock market histories.)

Information services

There are two kinds of information services: general purpose and specialized. General interest services usually offer numerous features—the latest news, sports, weather, and movie reviews. Additionally, you can look up airline schedules and make reservations, shop from computerized catalogs, exchange messages with other subscribers, and **download** (have the service send you) public domain software.

Specialized services maintain information for professionals—lawyers, journalists, stockbrokers, physicians, educators, librarians, and others.

Catalogs of information services are available. See what interests you and subscribe. Your dealer can probably help you subscribe to any of the more popular services. Your dealer can also tell you how to get your **user ID,** your **password,** and the local phone number of the information service.



Bulletin boards

Bulletin board systems appeared in 1978 as a way for local user-group members to exchange messages with each other and share programs by phone. Today there are over 300 computerized bulletin boards in the United States. Bulletin boards are popular for three reasons:

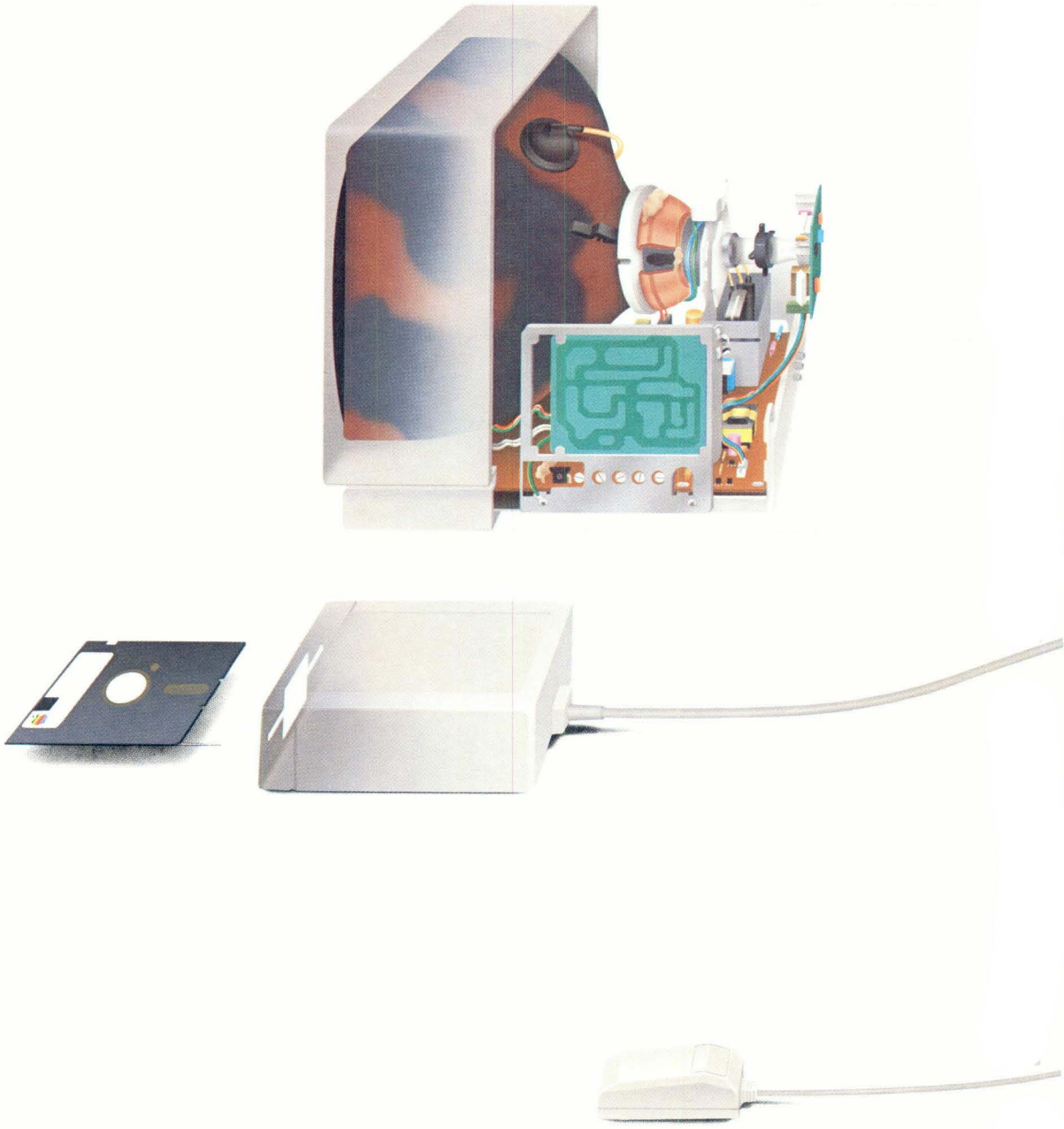
- Most are free. When not free, subscription rates for full access tend to be reasonable. You don't have to pay for **connect time** the way you do with an information service.
- They're a source of free software—some of it professional quality. However, no guarantees are made about its being free of bugs.
- People make new friends by leaving messages or "talking" to each other through their computers.

Normally, you don't have to belong to a computer club to use a bulletin board. All you need is the phone number for a local bulletin board system (BBS). Sources for phone numbers include computer clubs, BBS articles that appear in computer magazines, and computer dealers. Your dealer may even be the **system operator (SYSOP)** of a bulletin board.

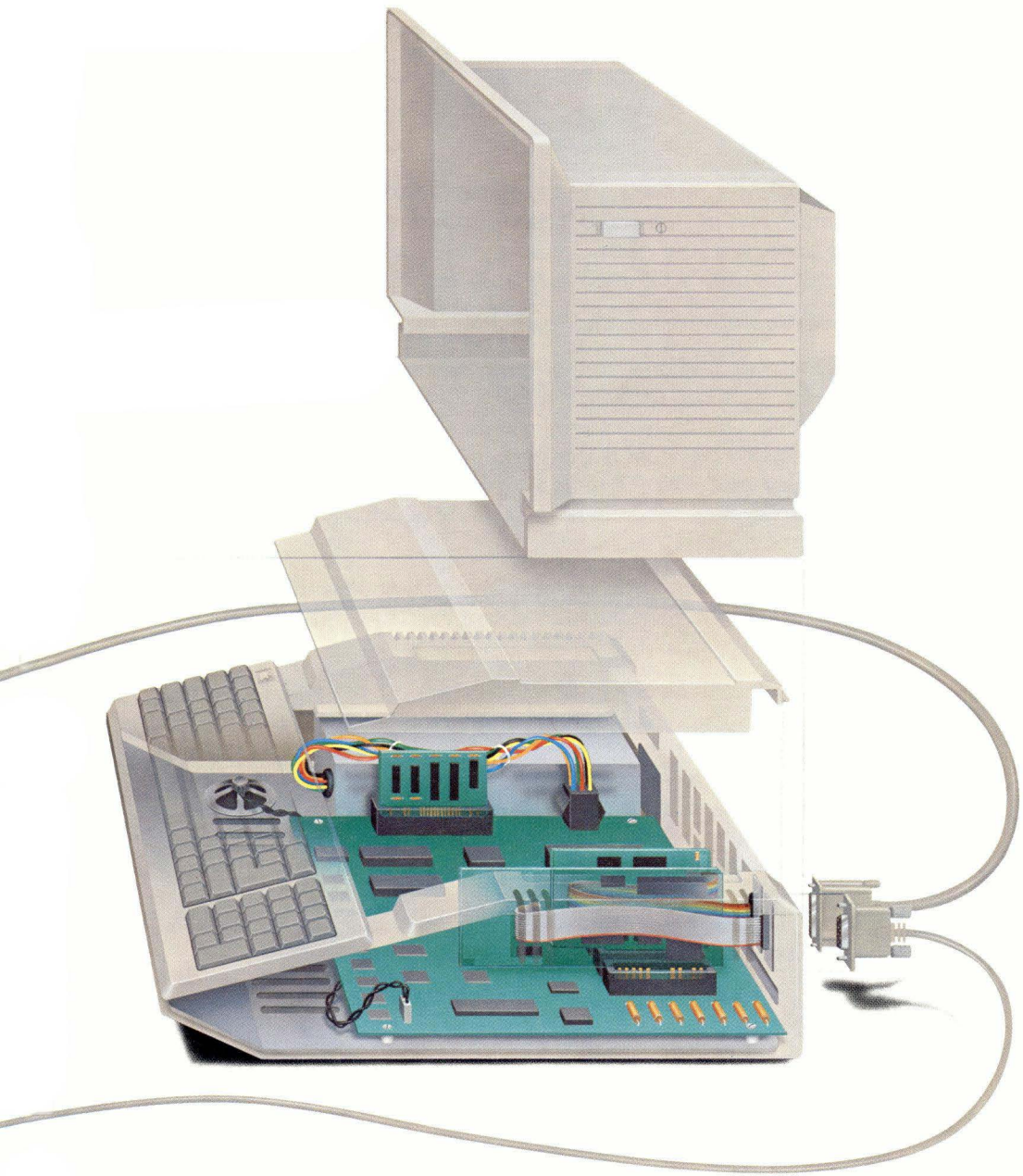
Chapter 7 summary

Where to go for help and information

- Your authorized Apple dealer
- An Apple user group
- Books and magazines
- On-line information services and local bulletin boards



Appendixes



Appendix A

Ask Apple

This appendix presents questions frequently asked by new Apple owners and the answers to those questions. If you have other questions, ask your dealer, people at an Apple user group, or write one of the Apple-oriented computer magazines.

Can I run software for other computers on my Apple computer?

The software that runs on the Apple uses one of Apple's operating systems: ProDOS, DOS, or Pascal. Software written for other computers doesn't necessarily use these operating systems and consequently won't work on the Apple, unless you install a co-processor card. (See Chapter 6.) You will find, however, that most major software publishers have versions of software that run on Apple computers.

I've heard horror stories about people typing pages and pages of information and then having it disappear. How can I prevent this from happening to me?

Save! Save! Save! Every application program has a way for you to transfer information from the computer's memory to a file on a disk. Once stored on a disk, information is reasonably safe. Information stays in memory only as long as the power is on and the computer is working properly. Power surges, electrical failures, computer failures, and accidentally disconnected power cords are rare occurrences, but they do happen—and usually just after you've entered half the names from your address book into a data base or written a brilliant letter. By saving frequently to a disk (at least every 10 minutes), you won't lose too much information.

Saving to a disk is only half the secret. At the end of the day, always make a backup copy of your disk. No matter how careful you are, disks can get damaged. The only way to guard against a damaged disk is to have a spare copy.

Can software break?

Software doesn't "break," but it may contain bugs. A **bug** is a programming error that causes unexpected or undesirable things to happen. Although software may appear "buggy," the problem can lie with the hardware or the user.

If you think your software has problems, check the manual first. If, after reading the manual, you still think the software is not working correctly, do a repeat test: Note the error and then follow the same sequence of steps to see if you can get the error to happen again. If it does, your next task is to figure out whether you have a hardware problem (something wrong with the computer itself or with a disk drive, for example). Try running other programs on your computer. If they also don't work properly, chances are that hardware is the problem.

If you try running the software on your dealer's computer and have the same problem, you've probably discovered a software bug. Once you've caught a bug, report it to your dealer. The dealer may have a patch (a corrected piece of software) or be able to help you work around the problem. If your dealer can't help, contact the software publisher directly; most have software support teams available to answer your questions.

How much do I need to know about operating systems?

Using a general utilities disk is the closest you may need to get to an operating system. If, however, you plan to do serious programming, you'll probably need more in-depth knowledge. If you choose to program in BASIC, read *BASIC Programming With ProDOS* and the *ProDOS Technical Reference Manual*. If you want to write DOS programs, you'll need the *DOS User's Kit*. (DOS is the operating system Apple used before ProDOS.) Finally, if you want to write Pascal programs, you'll need the Pascal operating system and the accompanying manual. Logo works with the ProDOS operating system; the Logo manuals explain how to use ProDOS with Logo.

What does ProDOS do that DOS doesn't?

ProDOS directly supports all Apple disk storage devices, including large-capacity hard disks. ProDOS increases the accessibility of disk storage because of extra commands. Also, disk read and write functions are faster under ProDOS.

What's booting?

In computer terminology, *booting* (or *bootstrapping*) means starting your computer. When you turn on the power, a built-in program (the Monitor program) is put into memory, where it turns on the disk drive. The disk drive then transfers the startup program on the disk to the computer's memory. All this must happen before the computer is ready to work. So, figuratively, booting is the computer pulling itself up by its own bootstraps.

Is my Apple very fragile? I worry about breaking it.

Your Apple is about as fragile as a television set or stereo. You can't break your Apple by pressing the wrong keys, just as you can't break your TV set by turning to the wrong channel.

Are disks fragile?

Disks are a lot more susceptible to damage than your computer. In fact, damaged disks are probably the most common cause for what people think is a broken computer or buggy software. With 5.25-inch disks, dust is a major offender. To guard against dust, always keep 5.25-inch disks in their envelopes and in some kind of disk storage case or box (even a shoe box). Although not as dangerous, dust is no friend to 3.5-inch disks either. However, with 3.5-inch disks, the danger comes from introducing dust into the disk drive. Keep disks away from extreme heat, sunlight, liquids, and anything that contains a magnet, like a telephone or magnetic copy stand.

When preparing labels for 5.25-inch disks, write on the label first, then stick the label on the disk. (This isn't necessary with 3.5-inch disks, because of their hard plastic case.) If you must write on a label that's already on a 5.25-inch disk, use a felt-tip pen, rather than a ball-point pen. A pencil or a ball-point pen could dent the surface of the disk. Never try to erase a disk label. Eraser particles can damage either kind of disk.

Is it OK to use both sides of a 5.25-inch disk?

Only if the disk is certified for double-sided use. You risk losing data when trying to use both sides of a single-sided disk. The *Apple Presents Apple* disks that come with the Apple IIe are specially made for two-sided use. The 3.5-inch disks used with Apple 3.5-inch drives are double-sided; the drive is designed to read and write data on both sides of the disk.

Do I need two disk drives?

Most software works with one disk drive. A second disk drive just makes several activities easier. You can put a program disk in drive 1 and a data disk in drive 2. This gives you a lot more room to store data.

A second drive speeds up the making of backup copies of disks. If you copy a disk with only one disk drive, you swap your original and backup disks in and out of your disk drive. With a second disk drive, you can put your original disk in one drive, your backup in the other, press a few keys, and then let your computer do the work.

If you are backing up a 3.5-inch disk to a 5.25-inch disk, you should copy individual files, not a whole disk at a time. (A 3.5-inch disk can hold over five times as much data as a 5.25-inch disk.)

Should I turn off my Apple after using it?

Leaving the Apple on for long periods of time won't harm it. If you're just taking a short break, leave your Apple on, but save your work before you go. If you're going away for more than an hour, you may want to turn it off. If you don't turn it off, remove the disk(s) from the drive(s). The reason is that if power to the computer is lost and restored, the computer will try to reboot, but may just spin the disk instead of starting. A long period of spinning can damage the disk.

Do I need a power surge protector?

You may want to invest in a surge protector to be on the safe side or if you live in an area that is particularly prone to electrical storms or electrical failures. If electrical service in your area is undependable, consider buying a battery pack. Then, if the electricity goes off, you have the time and the power to save your work before quitting.

Do I need to touch-type to use a computer?

No. Lots of people use the hunt-and-peck method on their computers. In fact, people who are not touch-typists report greatly increased typing speeds after a few days with a computer. If you want to learn to touch-type, you can buy a touch-typing program. These programs give you typing instructions on the screen and test your progress. Some are designed as games to make practice fun.

What is a K, and how much do I need?

To understand what a K (kilobyte) is, you first need to know what a byte is. A **byte** is the space that one character takes up in the computer's memory. A **kilobyte** is 1024 bytes. That means that an Apple computer with 128K can store a little over 128,000 characters in its memory. The more kilobytes your computer has, the more information it can store and the larger the programs it can run. A memory capacity of 128K is enough for most home applications and many business programs.

Is it bad for my eyes to look at the screen for too long?

Some people report getting headaches or eyestrain after lengthy sessions at the computer. Often, these symptoms are caused by sitting in the same position for long periods rather than from the way information is displayed. Try pausing occasionally and focusing on an object across the room. Also, stand up and stretch once in a while.

How do I use the extra memory added to my Apple?

You don't have to do a thing. Programs written for your computer find and use the extra memory automatically.

How can I get in touch with an Apple user group? What are the meetings like?

Ask your dealer or call (800) 538-9696, ext. 500. Meetings are informal gatherings of Apple owners. At a meeting, you can expect to get questions answered, see new products, and meet people with interests similar to your own. Many groups have a small membership fee to cover club costs, like a newsletter, a public domain software library, and refreshments.

How can I get free software?

You can get public domain software for free or for a nominal charge when you join an Apple user group. You should bring your own blank, formatted disks for the software.

Are parts for my Apple computer easy to get?

Apple's service is oriented toward modular repair, rather than supplying parts to customers. See your authorized Apple dealer for service. Apple offers an inexpensive repair insurance called Apple*Care*®, described in Appendix B. For details, talk to your authorized Apple dealer.

Why doesn't Apple offer a one-year warranty on its computers?

The Apple 90-day warranty is the industry standard. It covers faulty materials or workmanship. Faulty electronic parts tend to fail early (sometimes within hours), rather than wearing out over months or years as mechanical parts do. To detect faulty parts, many Apple dealers "burn in" a system before handing it over to the customer. To **burn in** means to leave a computer on for a number of hours with a program running.

Does Apple offer a mail-order catalog?

No. Apple doesn't sell products directly to customers. Your dealer has up-to-date information about Apple products and will be glad to help you select the items you need. You may also want to look at some of the independently published software catalogs (available through your dealer, local library, or bookstore).

How do I clean my disk drive?

It's better not to clean your drive yourself. The jackets of floppy disks lubricate the disks as you use them. If you have problems with your disk drive, see your authorized Apple dealer for cleaning, adjusting, or repair.

I got my Apple before I moved. Will dealers in my new area honor the warranty and help me with questions?

Any authorized Apple dealer will honor your warranty. Apple dealers are trained to answer questions about Apple products.

Can I take my Apple overseas as it is?

No. You need to buy a heavy-duty, step-down transformer from your dealer, so that your system can handle other voltages. Here's the formula for deciding which voltage transformer you'll need. Look on the back of *each piece of equipment* in your computer system and find the voltage requirement. Now add those numbers together. Then buy a transformer that meets your total system requirements. A typical Apple system requires a 100-watt transformer. Also be sure to purchase a monitor for your computer in the United States, because monitors made for other countries are different and may not work as well with your system. Again, consult your dealer about overseas requirements.

How did Apple get its name?

The name *Apple Computer* was chosen late one afternoon as Steve Jobs and Steve Wozniak, Apple's founders, faced the deadline for filing a Fictitious Name Statement (a business licensing procedure). After volleying names back and forth with Wozniak for hours, Jobs looked at the apple he was eating and decided that, unless he or Wozniak arrived at something better by five o'clock, they would call the company Apple. Five o'clock came and went; Apple was the new company's name.

Is there such a thing as the Apple I?

Yes. The Apple I was the first computer that Steve Jobs and Steve Wozniak created. The computer was designed at night in a lab at Hewlett-Packard and manufactured in a garage that belonged to Steve Jobs's parents. Although advanced for its time, it was still pretty primitive—no case, no keyboard, and no disk drive. As a result, Apple I owners found themselves digging through electronics stores for cases and keyboards and storing their programs and data on cassette tape. About 200 Apple I's were built. Collectors now pay between $10,000 and $15,000 for an Apple I.

Did the Apple I have a manual?

Yes. It was about eight pages long.

Who designed the Apple logo?

The Apple logo was designed by Regis McKenna, a Silicon Valley public relations firm. The original Apple logo was a design of Sir Isaac Newton under an Apple tree. But Newton didn't lend himself to reproduction, so Regis McKenna was called in to create a snappier insignia.

Appendix B

Guide to Service and Support

To help you get the most from your Apple system, Apple Computer, Inc. has established a worldwide network of full-support dealers. Your local authorized dealer has a complete package of services for you. Each has an Authorized Service Center with specially trained technicians. The center is equipped with the latest diagnostic programs and an inventory of replacement parts for fast, efficient service.

If you need answers to technical questions or information about product updates, your full-support dealers can help you. Apple's Technical Support organization backs each dealer to assure prompt, reliable assistance.

Service

If your system requires service, take it to any authorized Apple dealer. If you have moved, take it to the nearest Authorized Service Center. There are more than 3000 Authorized Service Centers worldwide. For the location nearest you, in the United States call (800) 538-9696; in Canada (800) 268-7796 or (800) 268-7637. If you live elsewhere, write

Apple Computer, Inc.
Attn: Customer Relations
20525 Mariani Avenue
Cupertino, CA 95014

During the initial warranty period, your dealer will repair or replace, at no charge, any Apple-manufactured product that proves to be defective. Apple also offers Apple*Care*® Carry-In Service, which will keep this same protection in force for an additional year. This coverage is available through your full-support dealer. (See "Apple*Care*" in this appendix for information.)

Support

If you have a problem, check your manual first. If you still have questions, call on your dealer for assistance. Apple training and technical support stand behind each dealer. Apple Technical Support provides your dealer with Technical Notes, answering commonly asked questions, and with access to technical support specialists. Your dealer has the latest information on new hardware and software products and will keep you informed about any product updates. If you want to upgrade your system, your dealer can help you select compatible components. For service and support, look to your authorized Apple dealer.

AppleCare

A 90-day warranty on parts and labor protects you from any unexpected service costs. You can add one full year to this protection with Apple's fixed-cost, carry-in service plan—Apple*Care*. It combines convenient service with fast turnaround.

Apple*Care* Carry-In Service is the lowest-priced service package in the industry. And your Apple*Care* agreement will be honored at all Apple Authorized Service Centers within the country of purchase—added insurance should you relocate. Local service means time saved in getting your Apple back to work.

Ask your Apple dealer for details. You may purchase Apple*Care* at any time. But for uninterrupted protection, buy it along with your system. Purchase with your system means you don't have to pay for the dealer inspection of your system that becomes necessary after the 90-day warranty has expired.

Apple*Care* is available through all authorized Apple dealers.

Appendix C

Troubleshooting

The cardinal troubleshooting rule is *Don't panic.* Instead, observe and analyze. You might begin with "General Troubleshooting Tips." If you get a specific message (like `DISK TOO FAST`) or have a specific problem (the monitor is blank, a drive doesn't respond), see "Finding and Solving a Problem."

General troubleshooting tips

Following these general troubleshooting tips can solve a variety of problems:

- If the problem occurs when you type something, check your typing. The computer is very literal. If you type `RYN` instead of `RUN`, it will respond with an error message, as it will if you type a lowercase `l` (el) instead of a `1` (one) or an `o` (oh) instead of a `0` (zero).
- Press Caps Lock down. (Programs designed for earlier models of the Apple II accept entries only in uppercase.)
- Check the program manual's error message section.
- Check the program manual to see if you did the problem procedure correctly.
- Get help from someone familiar with the program.
- Get help from your dealer. Dealers are usually knowledgeable about problems, although they may not know every feature of each program.

Finding and solving a problem

If general troubleshooting doesn't help, here's a list of specific symptoms, probable causes, and suggestions for recovering from a variety of problems. Problems are grouped under these nine categories:

- Problems starting the computer
- Problems switching between programs
- Problems quitting a program
- Problems with a display device
- Problems with a disk drive
- Problems saving data on a disk
- Problems with a printer
- Problems with a modem
- Two common error messages
- Problems understanding an error message

Find the heading that describes the general nature of your problem; then locate the specific description of your problem followed by suggested solutions. If none of the solutions works and you've checked the appropriate manuals, see your authorized Apple dealer.

Problems starting the computer

The power light doesn't come on when you start the computer.

Turn the power off. Then check your power cord connections. Is the cord plugged into the computer and into an outlet? If you're using a power strip, is it plugged in and turned on?

The computer stalls.

Sometimes, if you switch the power off and back on without pausing a few seconds, you can cause the computer to stall. This is actually a protection feature in the Apple power supply, protecting the circuitry from voltage overloads. If this happens, turn the computer off and wait at least one minute before turning it back on. If everything looks OK, see if the power outlet to which you've connected the computer is connected to an on/off switch. If so, find another outlet if at all possible.

Problems switching between programs

You see gibberish on the screen when you switch programs by turning the power off, then on again.

The first program wasn't entirely erased from memory before the next program was loaded. Wait a full minute before restarting your computer. Better yet, switch from one program to another by pressing ⌘-Control-Reset. Be sure to release Reset before you release the other two keys.

Problems quitting a program

Most programs give you an easy way out. If your program doesn't have a Quit option on the menu, try these escape methods (until you find one that works):

- Press Q for *Quit.*
- Press Esc.
- Press Control-C.
- Press Control-C; then press Return.
- Press Control-Reset.
- Press ⌘-Control-Reset.
- Turn off the power.

Problems with a display device

Nothing appears on the screen when you turn on the power.

When you see a blank screen even after the disk in-use light comes on and you hear the the disk drive working, check these four things:

- Is the monitor turned on?
- Is the monitor electrical cord plugged in?
- Is the monitor cable plugged into the computer and into the monitor?
- Are the contrast and brightness properly adjusted?

If you're working with a TV set, is the RF modulator properly installed? Is its switch properly set? Is the TV in working order?

If your TV set has a built-in video jack, check the switch on the back of the TV. Is it set to "TV" or to "Video"?

If you're working with an RGB card, is the card properly installed and is the cable properly connected?

If none of these is the problem, turn off the power and take the top off the computer. Is there a card in slot 3? It could be interfering with your display. Remove the card, replace the cover, and switch the computer on again.

The screen image is too bright or too dim.

The monitor's contrast or brightness isn't set properly. Adjust the contrast or brightness knob until the display is easy to read. (See the monitor manual to locate the controls.)

Unusual characters are intermingled with regular text.

The presence of non-keyboard characters (little arrows, check marks, and odd symbols) indicate that the application program you're using was designed for earlier models of the Apple IIe and is using a character set now reserved for MouseText characters. Ask your dealer if you can replace your program for an upgraded version.

You're using a television set, and the characters are small and blurry.

The program you're using is designed for an 80-column display. TV sets can display only 40 columns clearly. If the program gives you a choice, select the 40-column display. If it doesn't, use a monitor (if available).

Problems with a disk drive

The computer's power light comes on, but drive 1 doesn't activate.

Is the disk drive connected to the computer? If everything looks fine on the outside, check the inside. Turn the computer off and remove the top. Make sure the drive cable is firmly connected to the disk controller card and the card is in the correct slot.

Drive 1 may need alignment or adjustment. If you have more than one drive on the drive 1 controller card, switch their positions, if possible, and see if you can start from the other drive. If you can't, you may have a problem with the controller card or with the computer. Ask your authorized Apple dealer to check the drive, card, or computer, as necessary.

The startup disk spins without starting a program.

First, stop the disk drive by pressing Control-Reset.

Three things can cause this problem:

- A damaged program disk
- A damaged or unformatted disk
- A misaligned 5.25-inch disk

Try this simple procedure to recenter a 5.25-inch disk.

1. Remove the disk from the drive.
2. Adjust the disk's spindle hole so that its perimeter is centered in relation to the hole cut in the disk's jacket.
3. Very gently reinsert the disk in the drive
4. Close the drive door and restart the computer; press ♁-Control-Reset, releasing the Reset key first.

If two or three attempts at aligning the disk don't work, contact your dealer for help or a replacement. If the problem occurs with a program disk, contact either the dealer who sold you the program or the publisher of the program. See "Verify That a Disk Is Readable" and "Format a Disk" in the *System Utilities* book.

Drive 1 whirs briefly, but the program doesn't start.

Try a different startup disk. If it works, the problem probably lies with the first disk. It might not have an operating system on it, or it might be defective. See the dealer who sold you the program or contact the program's publisher. If different disks don't work, see your authorized Apple dealer for service. You may need to have drive 1 aligned or adjusted.

The disk drive won't stop whirring.

There's no disk in the drive, or the disk in the drive isn't formatted. Press Control-Reset to stop the disk drive. If the problem is with the startup drive, put a program disk in the drive and start again. Check the disk that wouldn't respond. Is it formatted?

A 5.25-inch disk is not handling information properly.

Symptoms include the disk not recording (saving) information, not loading previously saved information, not cataloging a data disk, or messages telling you the computer can't save or retrieve data.

You many not be positioning the disk properly in the disk drive. When you insert a disk into the drive, be sure that you feel and hear it click into place. Close the door completely.

If a 5.25-inch disk causes the problem, try the simple procedure in "The startup disk spins without starting a program" earlier in this section. Also see "Verify That a Disk Is Readable" in the *System Utilities* book.

The program won't start. All you see is a square bracket (]) prompt and a blinking rectangular cursor.

The prompt and the cursor mean you're in the Applesoft environment, ready to program. The reason is that the program on the disk isn't self-starting. (You're most apt to run into this situation with programs written by friends or those acquired from a user group.)

For DOS 3.3 disks, type `CATALOG` and press Return. For ProDOS disks, type `CAT` and press Return.

This should produce a list (catalog) of the files on the disk. You can run any of the programs with the letter *A* in front of them by typing `RUN` and the name of the program (usually in capital letters) and then pressing Return. For example, type `RUN BREAKOUT` and press Return to run a program titled "Breakout."

You can run some of the programs with the letter *B* in front of them by typing `BRUN` and the name of the program and then pressing Return. For example, type `BRUN BOOT13` and press Return to run the "BOOT13" program. The letters A (Applesoft) and B (Binary) refer to the program's file type. Other types are T (Text) and I (Integer BASIC).

The disk drive makes an even whirring sound, but nothing happens.

The disk is probably formatted by an early version of DOS (DOS 3.2 or earlier). To start from such a disk, you need a program on the *DOS 3.3 System Master* disk called "START13" that enables you to load DOS 3.2 programs. If you didn't get a *DOS 3.3 System Master* disk with your disk drive, get a copy from your dealer or a friend and then follow these directions for loading DO3 3.2 programs:

- *BASICS Disk:* DOS 3.2 programs may tell you to "boot the BASICS disk," as a way to load DOS 3.2 programs. The BASICS disk is no longer supplied with DOS because the START13 program is easier to use.

1. Start up your *DOS 3.3 System Master* disk.
2. Type `RUN START13` and press Return. You'll see this message:

```
13-SECTOR BOOT UTILITY
SLOT TO BOOT FROM (DEFAULT=6)?
```

3. Remove the *DOS 3.3 System Master* disk, put the DOS 3.2 disk in drive 1, and press Return to indicate that your disk controller card is in slot 6, the default slot. (If your controller card is in some other slot, type the slot number before you press Return.)

When you press Return, your program will load and run.

You see the message: `THIS IS A DATA DISK, NOT A STARTUP DISK`

The disk in the drive does not have an operating system on it. Remove the disk, insert a startup disk, and repeat the startup procedure.

You see the message: `CHECK DISK DRIVE`

There's no disk in the drive, or the disk isn't formatted. Put a program disk in the startup drive and repeat the startup procedure.

You see the message: `DRIVE TOO SLOW`

Your disk drive speed is too slow. Take the drive to your authorized Apple dealer and have the speed of your disk drive adjusted.

The "wrong" disk drive whirs when you start a program.

Stop the whirring disk drive by pressing Control-Reset. The disk drive that whirs when you turn on the power is drive 1. Move your program disk to the drive that whirred, the true drive 1.

Problems saving data on disk

You see the message: `DISK WRITE PROTECTED`

The program needs to write something on a disk, but it can't because you've covered the write-enable notch with a write-protect tab on a 5.25-inch disk, or the disk was write protected by the manufacturer to keep you from altering it. On a 3.5-inch disk, you have moved the write-protect tab to uncover the rectangular hole in the upper-right corner of the disk.

If the disk is write protected, try to remember why you chose to protect this information. To be on the safe side, you might remove the write-protected disk and insert another formatted disk on which to save the data.

You see the message: `DUPLICATE FILENAME`

A file with the name you gave already exists within the current directory. Give the file a different name and repeat the save procedure. Within a given directory, each file must have a unique filename.

You see the message: `DISK FULL`

Your disk doesn't have enough room to store all of the current file. Check the program manual to see if you can insert a different disk and save the file on the new disk. If you don't have any formatted disks handy, can you format a disk from within the program?

- *Pascal users:* You can compact files on your disk and make more room by issuing the Filer's Krunch command. Krunch your data disks regularly to keep maximum storage space available.

Problems with a printer

Your printout shows spacing problems.

How many spaces appear between lines in a printout depends on how many **line feeds** you request after every **carriage return.** No line feeds causes every line to be printed on the same line. One line feed yields a single-spaced document, and two, a double-spaced document. If you have a spacing problem, you need to change the number of line feeds accordingly.

You can turn line feeds on or off in any of three ways:

- With a **DIP switch** on the printer interface card.
- With a DIP switch on the printer itself.
- With the line feed option within the application program you're using.

See the manuals for these three elements for details on sending line feeds after carriage returns.

Problems with a modem

Meaningless characters appear on the screen.

Your modem is sending or receiving information at a different speed or in a different format than the modem on the other end of the phone line. To solve the problem, make sure your communications software and the other computer have the same

- **Baud** settings
- Number of **data bits**
- Number of **stop bits**
- Number of **parity bits**

Check your communications software manual for details on how to change settings. If you're using an information service, the manual should specify these settings.

Two common error messages

You see the message: `SYNTAX ERROR`

Some programs require that all your entries be in uppercase letters. Did you type in lowercase? Perhaps the program doesn't recognize the command or instruction you typed. Did you misspell a command or an instruction?

To put everything in capital letters, press Caps Lock down and type your entry again. Check your typing. If you made a mistake, retype the command. If that doesn't do it, check the manual. Does the command exist? Do you have its syntax (the form of the command) correct?

You see the message: `I/O ERROR`

This can happen with all peripheral devices, not just external disk drives. Check to make sure the device involved is securely connected into the computer. Also check the section on error messages in the device manual.

I/O stands for *input/output*. **Input** refers to information coming into the computer (from the keyboard, for example). **Output** refers to information traveling out of the computer (to a disk drive or printer, for example).

An `I/O ERROR` message means there is a problem with the exchange of information between the computer and one of its peripheral devices. You can usually guess what the problem is based on what you were trying to do when the message appeared. If you're trying to print something, the problem is probably the connection between the computer and the printer. If you're trying to load something from or save something to a disk, the problem is with the disk drive.

If an external disk drive is the problem, consider these possibilities:

- Did you put an unformatted disk in the disk drive?
- Did you put the wrong disk in the drive?
- If you're using a 5.25-inch disk, is the disk centered within its jacket?
- Could the disk be damaged? See "Verify That a Disk Is Readable" in the *System Utilities* book.

If none of these solutions fixes the problem, see your authorized Apple dealer. The device may need adjustment or repair.

Problems understanding an error message

Error messages can come from the operating system, the application program, or a programming language. If the operating system issued the message, refer to the operating system manual. (The *ProDOS User's Manual* explains ProDOS messages.) If the message came from an application program, see the program manual. If the programming language generated the message, see the language's reference manual.

Although it's not always easy to tell which entity generated the message, you might consider these rules of thumb before reading three manuals:

- If the message deals with a device (`I/O ERROR`), the operating system requires your attention. Also check the device in question. Is it connected? Is it on-line? Have you given it the proper software settings?
- If the message relates to an application activity (for example, `CIRCULAR FORMULA REFERENCE` in a spreadsheet or `FIELD TYPE INCOMPATIBLE` in a data base), you've violated an application rule.
- If you're not programming and you get a message like `GOSUB WITHOUT RETURN`, you've uncovered a program bug. If you're programming, dig out the reference manual.

If none of these contains the answer, it could be an error message issued directly from the computer. If this is the case, see the *Apple IIe Technical Reference Manual*.

Appendix D

Specifications

Processor: 65C02 eight-bit internal architecture, 1 MHz clock frequency.

Memory: 128K bytes of RAM; 16K bytes of ROM (includes Applesoft BASIC, disassembler and machine language Monitor program).

Display: 80-column display with built-in uppercase and lowercase characters, plus MouseText characters and color graphics capability.

Interfaces:

Display interface: composite video output (NTSC).

Audio cassette interface: input/output.

Joystick/hand control port.

Seven slots for peripheral device interface cards, plus AUX. CONNECTOR slot for memory expansion with pre-installed Extended 80-Column Text Card.

Keyboard: 81 keys (includes direction keys).

Input:

Line voltage: 95 to 127 volts AC, RMS.

Frequency: 50 or 60 Hz.

Power: 60 watts continuous, 80 watts intermittent.

Power supply: 12 volts internal.

Dimensions:

Weight: 12 pounds (5.45 kilograms).

Height: 4.5 inches (11.43 centimeters).

Width: 15.15 inches (38.45 centimeters).

Depth: 18 inches (45.72 centimeters).

Environment:

Operating temperature: 50°F to 104°F (10°C to 40°C).

Storing temperature: –40°F to 122°F (–40°C to 50°C).

Relative humidity (operating): 10% to 90%.

Altitude: Up to 15,000 feet (4615 meters).

For technical information, see the *Apple IIe Technical Reference*.

Appendix E

Apple II Family Differences

There are thousands of programs for the Apple II family of computers. You can run most of them on your Apple IIe, if you take into account the differences between the Apple IIe and the rest of the Apple II family. Table E-1 summarizes these differences. The rest of the appendix illustrates how these hardware differences affect software.

Table E-1
Apple II family system differences

	Memory	Keyboard	Micro-processor	Peripheral device interface	
Apple II Plus	48K; expandable to 64K with language card in slot 0.	51 keys; uppercase only.	6502.	8 slots (for peripheral device interface cards).	**Recommended slots** Slot 0 Language card Slot 1 Printer Slot 2 Modem Slot 3 80-column card Slot 4 Other device Slot 5 Drive 2 or other device Slot 6 Drive 1 Slot 7 Co-processor
Apple IIe (older models)	64K; expandable to 128K and beyond with memory card.	63 keys; uppercase and lowercase.	6502A (early model). 65C02 (late model).	8 slots (for peripheral device interface cards).	**Recommended slots** Slot 1 Printer Slot 2 Modem Slot 3 Empty (if a card is in Aux. Conn.) Slot 4 Mouse Slot 5 Drive 2 or hard disk Slot 6 Drive 1 Slot 7 Co-processor Aux. Conn. Extended 80-Column Text Card
Apple IIe (current model)	128K; expandable to 1 megabyte with memory card.	81 keys; uppercase and lowercase plus numeric keypad.	65C02.	8 slots (for peripheral device interface cards).	**Recommended slots** Slot 1 Printer Slot 2 Modem Slot 3 Empty (if a card is in Aux. Conn.) Slot 4 Mouse or memory expansion card Slot 5 Disk drive, hard disk, or mouse Slot 6 Disk drive Slot 7 Disk drive or co-processor Aux. Conn. Extended 80-Column Text Card
Apple IIc	128K; not expandable.	63 keys; uppercase and lowercase; Dvorak option.	65C02.	6 ports (interfaces for most popular peripheral devices are built-in).	**Icons** **Ports**  Joystick/hand controls/mouse  Modem  RF modulator (for TV set)  Monitor  External disk drive  Serial printer

Hardware differences				Languages in ROM	Operating Systems
120 chips	Open system (accommodates wide range of devices and co-processors).	U-shaped openings (accommodate variety of cable clamps).	**Additional features** ■ Tape recorder I/O ■ Slots for peripheral devices ■ Built-in speaker	Applesoft BASIC	DOS 3.2 DOS 3.3 ProDOS CP/M (with card) Pascal
31 chips (fewer chips mean greater reliability and a cooler-running system; MouseText characters in ROM).	Open system (accommodates wide range of devices and co-processors).	Rectangular openings (sized for standard DB-style connectors).	**Additional features** ■ Tape recorder I/O ■ Slots for peripheral devices ■ Built-in speaker	Applesoft BASIC	DOS 3.3 ProDOS CP/M (with card) Pascal MS-DOS (with card)
24 chips (fewer chips mean greater reliability and a cooler-running system; MouseText characters in ROM).	Open system (accommodates wide range of devices and co-processors).	Rectangular openings (sized for standard DB-style connectors).	**Additional features** ■ Tape recorder I/O ■ Slots for peripheral devices ■ Built-in speaker	Applesoft BASIC	DOS 3.3 ProDOS CP/M (with card) Pascal MS-DOS (with card)
38 chips (fewer chips mean greater reliability and a cooler-running system; MouseText characters in ROM).	Closed system (accommodates serial devices and standard peripheral devices).	Ports (for connecting peripheral device cables).	**Additional features** ■ Built-in 5.25-inch disk drive ■ 80/40-column switch ■ Keyboard switch (QWERTY or Dvorak) ■ Built-in speaker ■ Volume control	Applesoft BASIC	DOS 3.3 ProDOS Pascal

Running Apple II Plus programs on an Apple IIe

If you run Apple II Plus software on an Apple IIe, keep these differences in mind:

- Programs designed for the Apple II Plus don't recognize lowercase characters. Press Caps Lock and the programs should run.
- The Apple II Plus didn't have Delete, so programs designed for it won't respond when you press Delete. Check the program manual for instructions on how to delete characters.
- The Apple II Plus didn't have Up Arrow or Down Arrow, so programs designed for it won't move the cursor up or down when you press these keys. Check the program manual for instructions on how to move the cursor up and down.

Running Apple IIc programs on an Apple IIe

If you run Apple IIc software on an Apple IIe, keep these differences in mind:

- Apple IIc programs may refer to your *built-in* disk drive. That's the same as the Apple IIe's drive 1.
- Apple IIc programs may refer to the printer port, the mouse port, or the communications port. The printer port is comparable to a printer card in slot 1. The mouse port is comparable to a mouse card in slot 4. The communications port is equivalent to a communication card in slot 2.

Running older Apple II programs on an Apple IIe

The Apple IIe can take advantage of software developed for the Apple IIc—software that runs faster and has better graphics than was possible on earlier models of the Apple IIe. Your new Apple IIe is completely compatible with software designed for the Apple IIe with an Extended 80-Column Text Card.

Programs designed for earlier models of the Apple II won't take advantage of special characters available on the Apple IIe. But you may notice little apples and check marks in place of uppercase **inverse** characters in older programs.

These odd characters appear because the original **character generator ROM** (the ROM that generates screen characters) had two identical sets of uppercase inverse characters, one of which was unnecessary. In the new character generator ROM, the redundant set of uppercase inverse characters has been replaced with **MouseText characters,** the symbols shown in Figure E-1. Older Apple IIe programs that used the redundant set of uppercase inverse characters now display MouseText characters in their place.

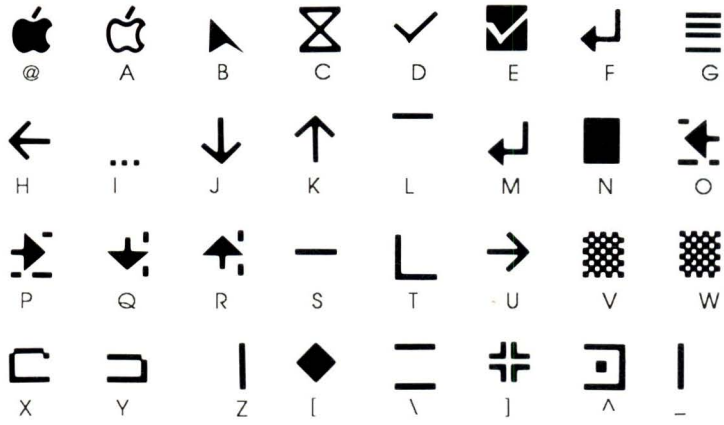


Figure E-1
MouseText characters

This doesn't affect the way the program works, but if the display bothers you, see your dealer or contact the developer of the program. Most popular Apple IIe programs have been upgraded to take advantage of MouseText. With a few older Apple IIe programs, you may encounter more serious problems:

- Programs that use reserved (instead of standard) memory locations may stop in midstream. (This is usually a problem with homemade software.)
- The copy-protection schemes for some programs may prevent them from starting. (This problem is mostly confined to game software.)

If you encounter problems, contact your dealer or the publisher of the software for an upgraded version of the software.

Keyboard differences

Your Apple IIe has three important changes to the keyboard that make it different from earlier Apple IIe's. First, you have a built-in numeric keypad with Enter and Esc keys. Second, this version replaces the Solid Apple key with the Option key. Finally, the key that used to be referred to as the *Open Apple key* is now simply called the *Apple key*.

Appendix F

Extended 80-Column Text Card

The Apple IIe Extended 80-Column Text Card gives you the option of displaying either 40 or 80 columns on your screen. It also adds 64K of memory.

This appendix describes the card and tells how to use several of its features. "Activating and Deactivating the Card" describes how to switch between the 80- and 40-column display in your own BASIC programs. (Programs you write in Pascal automatically display 80 columns.)

Text card and software considerations

Any application program requiring 128K of memory and an Extended 80-Column Text Card should automatically display 80 columns and use the auxiliary memory. However, Apple IIe software not designed to work with the card and some Apple II or Apple II Plus software will ignore the card's extra memory and continue to display data in 40 columns.

A television set or a video monitor?

Television sets cannot display 80 columns of text clearly. To use the 40-column display, deactivate the card. To display 80 columns of text, you need a monochrome or color monitor.

Programmable features

A number of the card's features are available to BASIC programmers. These include:

- 80-column display
- Special display features (INVERSE, FLASH, NORMAL, HOME, and tabbing)
- Escape features
- Control character functions

These BASIC features and functions are listed in "Escape Sequences in BASIC" and "Control Character Codes in BASIC." Pascal programmers should see "Pascal Screen Control Codes." When programming with the card, keep four things in mind:

- To display 80 columns and use the escape features and control character codes, you must activate your text card. (If you don't want to display 80 columns and use the features, just leave the card inactive.)
- After you have activated the card, you can switch the display from 80 to 40 columns without deactivating the card's other features.
- Always deactivate the card before you switch output from the display to a peripheral device such as a printer.
- Because many programs expect to find the card inactive, it's good programming practice to deactivate the card at the end of a program, thereby readying the card for other programs.

Activating and deactivating the card

This section tells how to activate the card, switch the display between 40 and 80 columns, and deactivate it again.

❖ *Note:* If you are writing programs in Pascal or running under the CP/M operating system, 80 columns of text are automatically displayed after you install the text card. See "Pascal Screen Control Codes" for details.

To activate the card:

1. Turn on your video monitor and start up the Apple IIe with the *DOS 3.3 System Master* disk or the *ProDOS User's Disk*. If you don't have a disk drive, turn the computer on and press Control-Reset.
2. If you started with ProDOS, select the BASIC option. Once you're in the BASIC programming environment, you'll see the square bracket prompt (]) and the blinking checkerboard cursor on the screen. (The blinking checkerboard cursor tells you the text card is inactive and the computer is in 40-column display mode.)
3. If you started from the *DOS 3.3 System Master,* press Caps Lock to switch to uppercase letters. (If you type lowercase characters, you'll get a `SYNTAX ERROR` message.)
4. Type `PR#3` and press Return. The cursor changes to a non-blinking rectangular cursor, indicating that the card is active and the computer is in 80-column display mode.

To deactivate the card:

1. Press Esc and release it.
2. Press Control-Q.

The blinking checkerboard cursor reappears with a backslash (\) just above the cursor.

To reactivate the text card, type `PR#3`.

Important When typing an escape sequence, don't press both keys at the same time, as you do when issuing control key commands.

You can activate and deactivate the card and switch the display at any time without wiping out the BASIC program in memory.

Switching displays

To switch back and forth between 80- and 40-column display while leaving the text card active, type the appropriate escape sequence.

To switch to 40-column display:

1. Press the Esc key and then release it.
2. Type 4.

The cursor becomes a nonblinking square.

To switch to 80-column display:

1. Press the Esc key and then release it.
2. Type 8.

The cursor becomes a nonblinking rectangle.

After you switch to 40-column display, the special escape features and control character functions remain available because the card is active.

Switching under program control

You can write BASIC instructions that control the text card from within a program. Here is a sample program that activates and deactivates the card and switches from 80- to 40-column and back to 80-column:

```
10 PRINT CHR$ (4); "PR#3": REM TURN ON CARD

20 GET X$: REM WAIT FOR KEYPRESS

30 TEXT: REM TURN ON TEXT MODE

40 PRINT CHR$ (17): REM Control-Q (40-COLUMN)

50 GET X$: REM WAIT FOR KEYPRESS

60 PRINT CHR$ (18): REM Control-R (80-COLUMN)

70 PRINT CHR$ (21): REM Control-U (TURN OFF CARD)

80 END
```

You can find more technical information, including instructions for using the text card's auxiliary memory, in the *Apple IIe Technical Reference*.

Escape sequences in BASIC

The escape sequences with the directional arrow keys are the standard cursor-moving keys on the Apple IIe. The escape codes with the I, J, K, and M keys are the standard cursor-moving keys on the Apple II Plus, and are present on the Apple IIe for compatibility. On the Apple IIe, you can type the escape sequences in either uppercase or lowercase letters.

Table F-1 gives the escape sequences available in the BASIC environment. Notice that some sequences stay in escape mode until you press Esc or a character key not found in an escape sequence (for example, the cursor-moving sequences). Other sequences end as soon as they are executed (for example, Esc F, which clears all text to the bottom of the screen). Remember to press the Esc key, release it, and then press the next key when issuing an escape sequence.

Table F-1
Escape sequences in BASIC

Sequence	Function
Esc @	Clears window and homes cursor (places it in upper-left corner of screen); exits escape mode.
Esc A	Moves cursor right one line; exits escape mode.
Esc B	Moves cursor left one line; exits escape mode.
Esc C	Moves cursor down one line; exits escape mode.
Esc D	Moves cursor up one line; exits escape mode.

Table F-1 (continued)
Escape sequences in BASIC

Sequence	Function
Esc E	Clears to end of line; exits escape mode.
Esc F	Clears to bottom of window; exits escape mode.
Esc I or Esc Up Arrow	Moves cursor up one line; remains in escape mode.
Esc J or Esc Left Arrow	Moves cursor left one space; remains in escape mode.
Esc K or Esc Right Arrow	Moves cursor right one space; remains in escape mode.
Esc M or Esc Down Arrow	Moves cursor down one line; remains in escape mode.
Esc 4	If 80-column firmware is active, switches to 40-column mode; sets links to BASICIN and BASICOUT; restores normal window size; exits escape mode.
Esc 8	If 80-column firmware is active, switches to 80-column mode; sets links to BASICIN and BASICOUT; restores normal window size; exits escape mode.
Esc Control-D	Disables control characters; only carriage return, line feed, BELL, and backspace have an effect when printed.
Esc Control-E	Reactivates control characters.
Esc Control-Q	If 80-column firmware is active, deactivates 80-column firmware; sets links to KEYIN and COUT1; restores normal window size; exits escape mode.

Control character codes in BASIC

Table F-2 lists control characters and their actions in the BASIC programming environment.

Table F-2
Control character codes in BASIC

Control	ASCII name	Apple IIe name	Action taken by BASICOUT
Control-G	BEL	Bell	Produces 1000 Hz tone for 0.1 second.
Control-H	BS	Backspace	Moves cursor one space to left; from left edge of window, moves to right end of line above.
Control-J	LF	Line feed	Moves cursor down to next line in window; scrolls if needed.
Control-K†	VT	Clear EOS	Clears from cursor to end of screen.
Control-L†	FF	Home	Moves cursor to upper-left corner of window and clears window.
Control-M	CR	Return	Moves cursor to left end of next line in window; scrolls if needed.
Control-N†	SO	Normal	Sets display format to normal.
Control-O†	SI	Inverse	Sets display format to inverse.
Control-Q†	DC1	40-column	Sets display to 40 columns.
Control-R†	DC2	80-column	Sets display to 80 columns.

Table F-2 (continued)
Control character codes in BASIC

Control	ASCII name	Apple IIe name	Action taken by BASICOUT
Control-S*	DC3	Stop-list	Stops listing characters on display until another key is pressed.
Control-U†	NAK	Quit	Deactivates 80-column video firmware.
Control-V†	SYN	Scroll	Scrolls display down one line, leaving cursor in current position.
Control-W†	ETB	Scroll-up	Scrolls display up one line, leaving cursor in current position.
Control-X	CAN	Disable MouseText	Disables MouseText character display; uses inverse uppercase.
Control-Y†	EM	Home	Moves cursor to upper-left corner of window (but doesn't clear).
Control-Z†	SUB	Clear line	Clears line cursor is on.
Control-[	Esc	Enable MouseText	Maps inverse uppercase characters to MouseText characters.
Control-\†	FS	Forward space	Moves cursor one space to right; from right edge of window, moves to left end of line below.
Control-]†	GS	Clear EOL	Clears from cursor to end of line (that is, to right edge of window).
Control-_	US	Up	Moves cursor up one line; no scroll.

* Works only from keyboard.
† Doesn't work from keyboard.

Pascal screen control codes

Table F-3 gives a summary of the Pascal video control functions. You can type uppercase or lowercase letters. For example, Control-E and Control-e do the same thing.

Table F-3
Pascal screen control codes

Control	Hex	Function
Control-E	$05	Turns cursor on (enables cursor display).
Control-F	$06	Turns cursor off (disables cursor display).
Control-G	$07	Sounds bell (beeps).
Control-H	$08	Moves cursor left one column; if cursor was at beginning of line, moves it to end of previous line.
Control-J	$0A	Moves cursor down one row; scrolls if needed.
Control-K	$0B	Clears to end of screen.
Control-L	$0C	Clears screen; moves cursor to upper-left of screen.
Control-M	$0D	Moves cursor to column 0.
Control-N	$0E	Displays subsequent characters in normal video. (Does not affect characters already on display.)
Control-O	$0F	Displays subsequent characters in inverse video. (Does not affect characters already on display.)
Control-V	$16	Scrolls screen up one line; clears bottom line.
Control-W	$17	Scrolls screen down one line; clears top line.
Control-Y	$19	Moves cursor to upper-left (home) position on screen.

Table F-3 (continued)
Pascal screen control codes

Control	Hex	Function
Control-Z	$1A	Clears entire line cursor is on.
Control-\| or \	$1C	Moves cursor right one column; if at end of line, does Control-M.
Control-} or]	$1D	Clears to end of line cursor is on, including current cursor position; does not move cursor.
Control-^ or 6	$1E	GOTOxy: initiates a GOTOxy sequence; interprets next two characters as x+32 and y+32, respectively.
Control-_	$1F	If not at top of screen, moves cursor up one line.

Glossary

accelerator device: A device that makes most software run up to four times faster.

accounting software: An application program that does accounting work, such as keeping track of accounts payable, accounts receivable, and inventory.

address: A number that identifies a location in the computer's memory or a location on a disk.

AppleCare: Apple's fixed-cost, carry-in service plan.

Applesoft BASIC: The Apple II dialect of the BASIC programming language. Applesoft is programmed into ROM on the main logic board. See also **BASIC.**

Apple key (🍎): A **control key** on the Apple II–family keyboards. The Apple key was called Open Apple on earlier models.

Apple II: A family of computers, including the Apple II, Apple II Plus, Apple IIe, Apple IIc, and Apple IIGS. The earliest version, the Apple I, was built in a garage in California.

Apple IIe Technical Reference Manual: A book containing detailed descriptions of all the hardware and firmware that make up the Apple IIe. A helpful reference for programmers and hardware designers, but not necessarily for computer novices.

application program: A program written for a particular purpose, such as home finance, education, or word processing. Compare **system program.**

arrow keys: The keys in the lower-right corner of the Apple keyboard that control the movement of the cursor in most programs.

ASCII: Acronym for **A**merican **S**tandard **C**ode for **I**nformation **I**nterchange (pronounced *ASK-ee).*
A communications code that defines the representation of letters, numbers, and punctuation marks for the computer and its peripheral devices.

assembly language: A low-level programming language in which individual machine language instructions are written in symbolic form. Because assembly-language programs require very little translation, they run very quickly and are, therefore, ideal for games and other applications that demand high-speed execution.

AUX. CONNECTOR: A slot inside the Apple IIe for cards that increase the memory or enhance the video capabilities of the computer.

back panel: The rear surface of the computer case. The power switch, power connector, and peripheral device connectors are on the back panel.

backspace: To move the cursor to the left. In some programs, backspacing erases the character the cursor moves over.

backup: A copy of a disk or a file. Make backup copies of important disks and files, just in case an original is lost, stolen, or damaged. If you can, make backups of your programs, too. (Some programs cannot be copied.)

BASIC: Acronym for **B**eginners **A**ll-purpose **S**ymbolic **I**nstruction **C**ode. A popular, high-level programming language. Apple Computer offers two versions for Apple II systems: Applesoft BASIC (built into firmware) and Integer BASIC (on disk).

baud: The rate at which a computer or a peripheral device can send and receive data; the number of signal elements per second. Often, but not always, equivalent to *bits per second.*

BBS: See **bulletin board system.**

binary system: A numbering system in which every number is expressed as a combination of zeros and ones. *On* is often represented as the number 1, *off* as 0.

bit: Contraction of *binary digit.* The smallest item of information a computer can handle. Usually represented as a 1 or a 0. In the Apple II family of computers, eight bits equal one **byte**.

bits per second (bps): A measurement of how fast a peripheral device can send and receive information.

block: A unit of disk storage. On Apple II systems, a block has a 512-byte capacity. The CATALOG command reports disk and file sizes in blocks.

board: See **main logic board.**

boot: See **start up.**

bps: See **bits per second.**

brightness knob: The knob on a video display device that controls how bright a display is.

bug: An error in software or hardware. The term reportedly comes from the early days of computing when an itinerant moth flew into a room-size computer and caused a breakdown.

bulletin board system (BBS): A computerized version of the ordinary bulletin boards on which people post messages, announcements, and advertisements. Many computerized bulletin boards offer free software.

burn in: To run a program for hours in a new computer for the purpose of detecting flawed components. Many dealers burn in computers before buyers take delivery of their new systems.

business graphics: Programs that present numerical information in graphic form, like a pie chart or a bar graph.

button: See **mouse button.**

byte: A unit of information consisting of a fixed number of bits. On Apple II systems, one byte consists of eight bits. One byte can represent an instruction, a letter, a number, a punctuation mark, or other character. See also **bit.**

C: A programming language popular among professional programmers, especially those writing software designed to run under the UNIX™ operating system.

CAD: See **computer-aided design.**

CAI: See **computer-aided instruction.**

Caps Lock: A key you can press and lock into place to capitalize letters without pressing Shift. Caps Lock doesn't affect non-alphabet keys.

card: See **interface card.**

carriage return: An **ASCII** character that ordinarily causes a printer or display device to place the next character on the left margin. Works like the return key on a typewriter.

CAT: Short for **cat**alog. A ProDOS command you can use to examine the contents of a disk. See also **CATALOG.**

CATALOG: A command in DOS and ProDOS that displays a list of the names and characteristics of all files in a directory.

catalog: A list of all the files on a disk. See also **directory.**

character generator ROM: The integrated circuit responsible for printing characters on the screen.

characters: Letters, numbers, punctuation, or other symbols that you can enter as text (visible characters) or as control characters. The letter *A* is a visible character; Control-G is not (it causes the speaker to beep).

chip: See **integrated circuit.**

circuit board: See **main logic board.**

circular connector: A specific type of serial connector having five connector wires (pins) and a circular shape. Compare **mini-circular connector.**

clock device: An interface device that keeps time. The clock can supply the time and date to software to perform a variety of tasks, like turning devices on and off at specific times and marking the time and date a file was last revised.

COBOL: Acronym for **CO**mmon **B**usiness-**O**riented **L**anguage. A business-oriented programming language especially suited to applications involving large amounts of data.

cold start: The process of starting a computer when the power is turned on. A cold start includes loading an operating system into memory, and then loading and running a program. Compare **warm start.**

column: A way of designating the width of a display or printout. A column is one character wide. The Apple IIe and Apple IIc can display 80 columns of characters.

command: A word or character that causes the computer to do something.

communications software: Programs that enable computers to exchange data.

compiler: A computer program that translates a language, such as Pascal, into a form the computer can execute. A compiler translates the entire program just once. Compare **interpreter.**

composite monitor: A type of monitor in which the video signal includes both display information, synchronization, and other signals. Monochrome and most color monitors are composite. Compare **RGB monitor.**

computer: An electronic device that performs predefined (programmed) computations at high speed and with great accuracy. A machine used to store, transfer, and transform information.

computer-aided design (CAD): Software for creating three-dimensional drawings.

computer-aided instruction (CAI): The use of a computer to help teach people through interaction with educational software.

computer system: A computer and its peripheral devices viewed as a working entity. Often the term includes software.

connector: A plug, socket, jack, or port.

connect time: The amount of time you spend communicating with an information service.

continuous-form paper: See **pin-feed paper.**

contrast knob: A dial on your video monitor for adjusting the relative brightness of characters and background on the screen.

Control: A specific key on an Apple II system keyboard that produces **control characters** when pressed in combination with another key or keys.

control character: Any key combination that includes pressing the **Control key.** Control characters perform actions rather than appearing as text characters. For example, Control-G causes the speaker to beep, and Control-M returns the cursor or print head to the left margin. Control characters are assigned **ASCII** values 0 through 31 and can be written into programs using ASCII codes.

control key: A general term for any key on a computer keyboard that controls the operation of other keys; for example, Caps Lock, Control, Apple, Option, and Shift. When you hold down or engage a control key while pressing another key, the combination makes that other key behave differently. Sometimes called a *modifier key.*

Control key: A specific key on Apple II–family keyboards that produces **control characters** when used in combination with other keys.

controller card: An interface card that connects a device such as a printer or disk drive to a computer's **main logic board** and controls the operation of the device; most commonly refers to a card that controls disk drives.

co-processor: A microprocessor device that overrides or works with the microprocessor on the main logic board.

copy protect: To make a disk uncopyable. Software publishers frequently try to copy protect their disks to prevent them from being illegally duplicated. Compare **write protect.**

courseware: See **educational software.**

CP/M: Stands for **C**ontrol **P**rogram for **M**icroprocessors. An operating system that works with the Z80 microprocessor.

CPU: Stands for **c**entral **p**rocessing **u**nit. See **microprocessor.**

cursor: A blinking underline, rectangle, bar, or other symbol that marks the place on the screen where the next character will appear. In some applications, the cursor is called the **pointer**.

D-shaped connector: A connector wider at the top than at the bottom. D-shaped connectors come in a variety of pin capacities and have either thumscrews or other screws on their sides to secure the plug to the socket.

daisy-chain: To connect a series of peripheral devices one to another.

daisy wheel: A printing element shaped like a daisy: characters are at the end of "petals" radiating from a central hub. Once in place inside the printer, the element spins to move each letter into position as needed for printing. Sometimes called a *print wheel.*

daisy wheel printer: A printer that uses a **daisy wheel** to print characters on paper.

data: Information, especially information used and operated on by a program. The smallest unit of information a computer can process is a **bit.**

data base: (1) A collection of information organized in a form that allows easy access. (2) An application program that organizes, stores, retrieves, analyzes, and modifies information. Also called a *data base management system.*

data bits: The bits in a communication transfer that contain information, as opposed to bits that signal a start or a stop.

data disk: A disk that contains your work—letters, budgets, pictures, and so on—in the form of files.

data manager: See **data base.**

default: A preset response to a question in a program. Unless you specify otherwise, the program will work with the default.

Delete: A key that (in some programs) erases the character to the left of the cursor.

desktop publishing: The practice of composing and printing newsletters, brochures, newspapers, and so forth with a personal computer, printer, and composition software.

destination volume: The disk you're copying to. Compare **source volume.**

device: See **peripheral device.**

DIP: See **dual in-line package.**

DIP switches: A bank of tiny switches, each of which can be moved manually up or down to represent one of two values (usually on and off). See **dual in-line package.**

directory: A list of all the files on a disk, or a file that contains the names of other files on the disk. Sometimes called a **catalog.** See also **subdirectory.**

disk: An information storage medium consisting of a flat, circular magnetic surface on which information can be recorded in the form of small magnetized spots, in a manner similar to the way sounds are recorded on tape. See **floppy disk, hard disk.**

disk controller card: An interface card that connects one or more disk drives to an Apple IIe. Its job is to handle the communication of data between the computer and the disk drive. Also called *disk controller* or *controller.*

disk drive: A device that spins a disk to either record or retrieve information. A disk drive is to a computer what a cassette deck is to a stereo system Also known as a *drive.*

disk drive light: See **in-use light.**

diskette: See **disk.**

Disk Operating System (DOS): A software system for the Apple II family of computers that enables the computer to control and communicate with one or more disk drives. The acronym *DOS* rhymes with *boss.* Apple disk operating systems include **DOS 3.2, DOS 3.3, PoDOS,** and **Pascal.**

disk utilities: Programs that work directly on disks and files. Common utilities can format disks, copy disks, delete or rename files, and even recover lost files.

display: A general term to describe what you see on the screen when you're using the computer.

document: A collection of information stored on a disk. Synonymous with **file.**

DOS 3.2: Stands for **Disk Operating System.** An early Apple II operating system; 3.2 is the version number.

DOS 3.3: Stands for **Disk Operating System.** One of three operating systems used by the Apple; 3.3 is the version number.

dot matrix printer: A type of printer that forms characters with patterns of dots produced by tiny striker wires. Compare **daisy wheel printer.**

Down Arrow: A key that (in most programs) makes the cursor move down one line.

download: To send a file from one computer to another.

drive 1: The first disk drive the computer looks to for a program disk, when you start the system.

Dvorak keyboard: A highly efficient arrangement of keys that improves typing speed. Compare **QWERTY keyboard.**

dual in-line package (DIP): An integrated circuit packaged in a small narrow box with two rows of metal pins on its underside. **DIP switches** set into the box allow you to change settings. For example, printer DIP switches control functions such as line feed, form length, and **baud** setting.

edge connector: A flat connector commonly found on the bottom edge of an interface card, having flat, gold strips ("fingers") where the card fits into a slot.

educational software: Software that teaches something. Compare **computer-aided instruction.**

80-Column Text Card: A card made by Apple Computer that allows the screen to display as many as 80 columns (characters) on a line.

Enter: A key on the Apple IIe's numeric keypad. It performs the same function as Return in most applications.

envelope: A paper or plastic sleeve that protects disks when they're not in use. Compare **jacket.**

error message: The computer's way of alerting you to a failure in the communication process; often accompanied by a beep.

Escape (Esc): A key that (in some programs) takes you back one level on a menu or cancels a procedure.

Extended 80-Column Text Card: A card made by Apple Computer that allows the screen to display as many as 80 columns (characters) on a line and extends the computer's memory by 64 kilobytes (64K).

fanfold paper: See **pin-feed paper.**

file: A collection of information stored on a disk under a particular name. Programs and data are both considered files. Also called a *document.* See also **filename.**

file management: A general term for copying files, deleting files, and other housekeeping chores involving the contents of disks.

filename: The name you give a file before you save it on a disk. A filename serves as an identifier for the file. *File* and *name* became one word in the early days of computing, because operating systems wouldn't allow a space character in a file name.

firmware: Another name for the programs in ROM (read-only memory). It's more permanent than the software in RAM (random-access memory)—thus the name.

5.25-inch disk: A flexible plastic disk 5.25 inches in diameter with a thin, flexible jacket. Usually called a *floppy disk.*

fixed disk: See **hard disk.**

flexible disk: Another name for *floppy disk.* See also **disk.**

floppy disk: A disk made of flexible plastic, as compared to a **hard disk,** which is made of metal. The term *floppy* is now usually applied only to disks with thin, flexible disk **jackets,** such as 5.25-inch disks. With 3.5-inch disks, the disk itself is flexible, but the jacket is made of hard plastic; thus, 3.5-inch disks aren't particularly "floppy."

font: In typography, a complete set of type in one size and style. In computer usage, a collection of letters, numbers, punctuation marks, and other typographical symbols with a consistent appearance. The size can be readily changed.

format: To divide a disk into tracks and sectors where information can be stored. Disks must be formatted before you can save information on them. Also called **initializing.**

FORTH: A programming language preferred by many programmers for its speed, compactness, and facility in creating new commands.

Fortran: Acronym for **for**mula **tran**slation. The first high-level programming language. It remains popular today for scientific and mathematical programming.

game program: A program designed for entertainment and sometimes for education as well.

graphics: Information presented in the form of pictures or images, either on the screen or on printouts.

graphics tablet: A tablet-like device with a stylus. Pictures that you draw on the tablet appear on the screen. These pictures can be edited and saved to disk.

hacker: A person who lives to program.

hand controls: Peripheral devices, like game paddles and joysticks, with which you can move objects on the screen. Hand controls are used in games, but they can also be used in other applications.

hard copy: A printed copy of a document produced with the computer.

hard disk: A disk made of hard metal and sealed into a drive or cartridge. A hard disk can store very large amounts of information compared to a **floppy disk.** Also called *fixed, rigid,* or *Winchester disk.*

hard disk drive: A device that holds a hard disk, retrieves information from it, and saves information to it. Hard disks made for microcomputer use are permanently encased in the drive.

hardware: Those parts of the computer that you can see and touch; also its components, interface cards, and peripheral devices. Compare **software.**

home control devices: Devices that can control home thermostats, turn lights on and off, monitor alarm systems, and the like.

home finance program: A program for home budgeting, portfolio management, and tax planning.

IC: See **integrated circuit.**

icon: An image that represents an object, a concept, or a message. For example, the monitor icon on the back panel indicates the jack where you plug in the monitor.

industry specific software: See **special interest software.**

information service: A large data base from which subscribers can draw news, stock quotes, movie reviews, and other information. Some also have software, electronic mail services, and electronic catalogs for discount shopping.

initialize: To prepare a disk so the computer can store information on it. Another word for **format.**

ink jet printer: A type of printer that forms impressions on paper by squirting dots of ink on the paper. As with dot matrix printers, the dots form characters or graphics.

input: The data you give to a program for processing; it can come from the keyboard, a disk, a modem, or some other device.

input/output (I/O): The processes by which the computer takes input (for example, characters typed at the keyboard) into its memory and moves output to a peripheral device (like sending characters to the screen of a video monitor). Input and output occur between the computer and all of its devices, like disk drives, printers, and modems.

integrated circuit: A miniaturized electrical circuit etched on a silicon chip. Usually this chip is mounted in a plastic case or "package." The case has pins that connect into a circuit board. Also called an *IC* or a *chip.*

integrated software: A group of application programs, usually on one disk, designed to share data. Typically, such software includes a word processor, data base, and spreadsheet.

interface: Hardware or software through which computers and devices communicate.

interface card: A card you plug into an Apple IIe to link the computer to a peripheral device. Sometimes called a *peripheral card* or just *card.*

interpreter: A language translator that reads through a program statement by statement, translating and executing each instruction before proceeding to the next statement. Compare **compiler.**

in-use light: A light on the front of a disk drive that is on when a disk drive is active—either loading data from or storing data on a disk. Also called the *disk drive light.*

inverse video: A way to display characters, such that the brightness of the character and its background are reversed. For example, a normally bright character becomes dark, and its normally dark background becomes bright.

I/O: See **input/output.**

I/O ERROR: A message that appears when the computer has a problem communicating with a peripheral device.

jack: A simple, single-pin connector; for example, the video jack on the back panel of an Apple computer.

jacket: For a 5.25-inch disk, the square plastic wrapper into which the disk is sealed. For a 3.5-inch disk, the plastic case into which the disk is sealed. The jacket protects and cleans the disk. Never remove a disk from its jacket. Compare **envelope.**

joystick: An accessory that moves creatures and objects in game programs.

K: See **kilobyte.**

keyboard: The principal device for communicating with the computer. It looks and responds much like the keyboard on a typewriter.

keypad: See **numeric keypad.**

keys: See **control key, special keys,** and specific names of keys.

kilobyte (K): A unit of measurement consisting of 1024 (2^{10}) **bytes.** In this usage, *kilo* (from the Greek, meaning one thousand) stands for 1024. Thus, 64K equals 65,536 bytes. See also **megabyte.**

laser printer: A printer that combines laser and photocopier technology to produce printed documents of near-typeset-quality.

Left Arrow: A key that, in most programs, moves the cursor one character to the left. In some programs, pressing Left Arrow erases characters to the left as the cursor moves to the left.

letter quality printer: See **daisy wheel printer.**

line feed: A character that advances the cursor or, on a printer, the print head to the next line.

LISP: A programming language favored by people working in the field of artificial intelligence.

load: The process of moving a program or data from a disk into random-access memory (RAM).

Logo: A computer language with excellent graphics capability that encourages learning through discovery.

machine language: The language of ones and zeros that is the only language the computer can execute. All other languages, like BASIC, have to be translated into this binary code before the computer can execute them.

main circuit board: See **main logic board.**

mainframe computer: A computer with far greater processing power and memory capacity than a personal computer. Large and expensive, mainframes maintain transactions for banking systems, insurance companies, chain stores, and information services.

main logic board: A collection of integrated circuits (chips) connected on a board that holds RAM, ROM, the microprocessor, custom integrated circuits, and other components. Together, these elements give the computer its ability to compute. Sometimes called the *main circuit board.*

main memory: See **random-access memory.**

mass storage device: Another word for a hard disk drive or for any device that can store large amounts of data.

megabyte (Mb): Approximately one million bytes; more precisely, one megabyte is equal to 1024 **kilobytes.**

memory: Integrated circuits (chips) that store instructions and data for the microprocessor to operate on. There are two kinds of memory: temporary and permanent. See also **random-access memory** and **read-only memory.**

menu: A list of choices displayed by many programs, from which you can select an action.

menu bar: The horizontal strip at the top of the screen that bears menu titles in some application programs.

microprocessor: The "brain" of the computer. The Apple has a 65C02 eight-bit microprocessor. Also known as the *CPU* (central processing unit).

mini-circular connector: A specific type of serial connector that communicates data though an 8-pin interface. Compare **circular connector.**

modem: Short for *modulator/demodulator.* A device that links your computer to other computers and information services over telephone lines.

modifier key: See **control key.**

Modula-2: A programming language created by the inventor of Pascal.

monitor: A display device that receives video signals through a direct connection to a computer's video port. Unlike a TV set, it cannot receive broadcasted television signals. Also called a *video monitor.*

monochrome monitor: A monitor that uses only a single color on a background; for example, white on black, amber on black, or green on black.

mouse: An input device that controls a pointer on the screen. By moving the mouse and pressing its button, you can draw pictures, select from lists, and move things around the screen.

mouse button: The button on top of the mouse. Usually, pressing the mouse button initiates some action on whatever is under the pointer. Releasing the button confirms the action.

mouse-driven program: A program that can respond to mouse commands.

MouseText: A special character set built into the Apple IIe that includes characters like check marks and little apples.

MS-DOS: The operating system for programs designed to run computers other than Apple computers, such as the IBM personal computer.

music synthesizer: A device that simulates musical instruments; used for playing and creating musical compositions.

network: A number of computers linked together for the purpose of sharing peripheral devices, programs, or information.

numeric keypad: A cluster of number keys arranged in a calculator layout for rapid entry of numbers on the Apple IIe. The keypad generates the same characters as numeric keys on the top row of the Apple keyboard.

on-line: The condition of any device to which a computer has immediate access.

open architecture: A type of computer design, like the Apple IIe's, that includes slots on the main logic board. Users can enhance the computer's capabilities by plugging interface cards into these slots.

operating system: A program that, among other things, controls how information is loaded into memory, how the computer works with the information, how information is stored on a disk, and how the computer communicates with peripheral devices. ProDOS, DOS 3.3, and Pascal are three operating systems available for the Apple.

Option key: A **control key** on Apple II–family keyboards.

output: The information that results from processing. This includes what you see on your screen, printouts, and files saved on disk.

parallel interface: An interface that transmits data between a computer and a peripheral device data eight bits at a time. Compare **serial interface.**

parity bits: Bits used to check for errors during data transmission. Compare **data bits.**

Pascal: A programming language favored in computer-science courses because it is easy to read and stresses a systematic approach to problem solving; it is also popular with many professional programmers.

password: A word known only to you that confirms your identity as a subscriber to an information service or to a network.

pathname: A name formed by combining directory, subdirectory, and file names to specify a particular file. For example, if you had a disk named *Trees,* a subdirectory named *Apple,* and a file named *Delicious,* the pathname would be */Tree/Apple/Delicious.*

peripheral: Short for **peripheral device.**

peripheral card: See **interface card.**

peripheral device: A piece of equipment, like a printer or a modem, that you connect to a computer to give it a particular capability.

PILOT: Acronym for **P**rogrammed **I**nquiry, **L**earning, **O**r **T**eaching. A programming language favored by teachers for designing their own educational software.

pin-feed paper: Paper designed for continuous feeding into a printer. Pinfeed paper has little holes running along the vertical margins that a mechanism in the printer engages. Perforations between pages make for easy separation of pages. Also called *fanfold paper* and *continuous-form paper.*

plotter: A device that prints charts and graphs by drawing with pens.

pointer: A marker that moves across the screen when you move the mouse (in mouse-driven programs). Compare **cursor.**

port: A socket on the back panel of a computer where you can plug in a cable to connect to a peripheral device, another computer, or a network.

power light: A light on the keyboard that tells you whether or not the computer is turned on.

power strip: A device containing multiple three-pronged sockets that plugs into a three-hole, grounded outlet. A must if you have more than two devices that need to be plugged into a grounded, three-hole outlet.

power supply: A device that converts electricity from an outlet to the low voltages that power a computer. The Apple power supply includes some protection against severe voltage changes.

power switch: A rocker switch on the back of the computer that you press to turn the computer on or off.

print: To send text or graphics from the computer to a printer for reproduction on paper.

print buffer card: A memory card that holds documents for printing. You can send an entire file to the card and continue working at the computer while the file prints. Without such a card, you must wait until the printer finishes its work before you can continue with yours.

printer: A device that produces a paper copy of information you create on the computer. See also **daisy wheel printer** and **dot matrix printer.**

print wheel: See **daisy wheel.**

ProDOS: Short for **Pro**fessional **D**isk **O**perating **S**ystem. The primary operating system for the Apple IIe and Apple IIc. See also **operating system.**

ProDOS User's Disk: A set of programs for manipulating files created with ProDOS-based programs. See also **disk utilities.**

program: (n.) Instructions that tell the computer what to do. (v.) To write a set of instructions for the computer to execute.

program disk: A disk containing an operating system and a self-starting program.

programmer: A person who writes computer programs.

prompt: A symbol, message, or menu that asks you for a response or indicates that you can take an action.

public domain software: Uncopyrighted software that you can copy, use, and distribute without a licensing agreement. Such software is usually free or available at a modest fee from user groups or through computer bulletin board systems.

pull-down menu: A menu that remains hidden until you click its title (using a mouse).

QWERTY keyboard: The standard layout of keys on a typewriter keyboard. Its name comes from the first six letters on the top row of the letter keys. Compare **Dvorak keyboard.**

radio-frequency interference: Any electrical signal that can interfere with the proper operation of electrical or electronic equipment.

radio-frequency (RF) modulator: A device that converts data from the computer for display on a television set.

RAM: See **random-access memory.**

RAM card: A card that expands the memory of your Apple beyond 128K. With more memory, you can work with larger application programs and create larger files.

random-access memory (RAM): Memory in which information can be referred to in an arbitrary or random order. As an analogy, a book is a random-access storage device, because you can open it and read at any point. RAM usually means the part of memory that you can both add information to and read information from. Any data in RAM disappears when the computer is turned off. Also called *temporary, main,* or *working memory*. (Technically, read-only memory [ROM] is also *random access,* and what's called *RAM* should correctly be termed *read-write memory.*) Compare **read-only memory, read-write memory.**

read: To get information from a disk and put it in memory.

read-only memory (ROM): Permanent memory: its contents do not disappear when the power is turned off. Applesoft BASIC is stored in ROM, as are the computer's startup routines.

read-write head: The mechanism inside the disk drive that gets information from disks and records information on disks.

read-write memory: Memory whose contents can be both read and changed (or *written to*). The information contained in read-write memory is erased when the computer's power is turned off and is permanently lost, unless it has been saved on disk.

remote computer: A computer connected to your computer whether directly by a cable or through telephone lines.

Reset: A key that, when pressed in combination with other keys, halts what the computer is doing. What happens next depends on the particular keys pressed with Reset.

restart: Start the computer again.

Return: A key that moves the cursor to the beginning of the next line. Many programs interpret Return to mean that you've finished doing something and are ready to proceed. Compare **Enter key**.

RF modulator: See **radio-frequency modulator.**

RGB card: A card that translates the computer's video signal for RGB monitors.

RGB monitor: A type of color monitor that receives separate signals for the colors red, green, and blue. Compare **composite monitor.**

Right Arrow: A key that (in most programs) moves the cursor one character to the right.

ROM: See **read-only memory.**

run: To cause a program to execute or carry out instructions.

save: To store a program or data on a disk (as opposed to storing it temporarily in RAM memory).

scroll: To move new text into view on the screen. Most applications can scroll vertically; some can also scroll horizontally.

sector: The formatting process divides disks into concentric circles called *tracks* and tracks into sectors. See also **track.**

serial interface: An interface that communicates data between a computer and a peripheral device one bit at a time. Compare **parallel interface.**

shielded cable: A cable that reduces the emission and reception of electromagnetic waves so that a computer system won't interfere with radio, television, and other electronic devices. Shielding also keeps other electronic devices from interfering with the computer.

Shift: A key that when pressed in combination with another key yields an uppercase letter or the upper character on a two-character key.

shutter: The metal plate on a 3.5-inch disk that protects the disk medium. Once placed in a drive, the drive mechanism slides the shutter aside so that the read-write head can have access to the disk.

simulation: A computerized representation of something. Computer chess-playing games and programs testing the aerodynamic qualities of a wing design are examples of simulations.

single-sheet feeder: A device that attaches to a printer and feeds single sheets of paper to the printer as needed. An efficient way to print multipage documents on letterhead.

65C02: The eight-bit microprocessor that does the computing in the Apple IIe.

slot: A long, narrow connector on the Apple IIe main logic board into which you plug an interface card. On the Apple IIc, devices are connected to **ports** on the back panel.

software: Programs, the sets of instructions that tell the computer what to do. Compare **hardware.**

software directory: A book that lists available software.

software pirate: A person who makes illegal copies of software.

source volume: The disk you're copying from. Compare **destination volume.**

Space bar: The bar at the bottom of the keyboard; pressing it inserts a space character into your text.

special interest software: Software written for specific purposes, like aeronautic design, medical diagnoses, or legal research. Also called **vertical market software** and **industry specific software.**

special keys: Keys that produce actions rather than characters on the screen; for example, see Apple, Backspace, Caps Lock, Enter, Esc, Option, Reset, Return, Shift, Tab, and the arrow keys.

spreadsheet: A type of application program that simplifies financial planning, cost estimating, and other number-crunching tasks.

START13: A program on the *DOS 3.3 System Master* disk that makes it possible to run DOS 3.2-based programs.

start up: To get a computer system running. Starting up is the process of first reading the operating system program from the disk and then running an application program. Also called *boot*.

startup disk: The first disk used in a two-stage startup. (A startup disk must contain the operating system). Also, any disk with which you can start a computer.

stop bit: One or two bits that indicate the end of a character.

store: To save your work to a file on disk. Work that you don't store disappears when you turn off the computer's power.

subdirectory: A directory within a directory, for organizing files on large-capacity disks.

SuperPILOT: Apple's version of a popular programming language. See also **PILOT.**

surge protector: A device that protects a computer system by stopping sudden voltage surges and spikes.

SYNTAX ERROR: An error message that occurs when you misspell a computer command or violate the rules of a programming language's syntax.

synthesizer: See **music synthesizer.**

SYSOP: See **system operator.**

system: See **computer system.**

system operator (SYSOP): A person who manages a computerized bulletin board system.

system program: A program that makes the resources of a computer available for general purposes, rather than for specific tasks. Compare **application program.**

Tab: A key moves the cursor forward a preset number of characters (usually eight), much like the Tab key on a typewriter.

template: Most often, a grouping of labels and formulas that perform a specific task (like calculating depreciation) within a spreadsheet program. Templates are available for other applications like data bases.

temporary memory: See **random-access memory.**

thermal transfer printer: A quiet, inexpensive type of printer that works by "burning"characters on treated paper.

3.5-inch disk: A flexible plastic disk 3.5 inches in diameter with a hard-shell plastic jacket. Two-sided 3.5-inch disks can store almost six times more data than single-sided 5.25-inch disks.

traces: Printed electrical circuits that connect the components on a circuit board.

track: One of the concentric circles magnetically inscribed on a disk when you format it. See also **sector.**

two-stage boot: See **two-stage startup.**

two-stage startup: A startup procedure that requires two disks.

Up Arrow: A key that, in most programs, makes the cursor move up one line.

user group: A computer club.

user ID: A number that identifies you as a subscriber to an information service or a network.

user interface: The rules and conventions by which a computer or a program communicates with you.

utilities: See **disk utilities.**

vertical market software: See **special interest software.**

video digitizer: A device that converts visual images into a form that a computer can store in memory or on disk. With the proper software, you can edit digitized images.

video monitor: See **monitor.**

voice input device: A device that translates the spoken word into a form that some software can process.

volume: A general term for a storage device, like a disk.

volume name: The name of a volume or its main directory.

warm start: The process of transferring control back to the operating system. People do warm starts to start a new program when they've finished an old one or in response to a program failure. Also called a *warm boot.* Compare **cold start.**

Winchester disk: See **hard disk.**

word processor: An application program that makes writing and editing easier and faster.

working memory: See **random-access memory.**

wraparound: The action of the cursor automatically advancing to the start of a new line when it reaches the end of the previous line.

write: To record information on a disk.

write-enable notch: A small, square cutout in the upper-right corner of a 5.25-inch disk. If the notch is covered, you can't change the information on the disk. If uncovered, you can.

write protect: To prevent changes to the contents of a disk or a file. Once you have write-protected a disk or file, you can still read the contents but you can't write to it.

write-protect tab: A sticker that you can put over the write-enable notch on a 5.25-inch disk. On a 3.5-inch disk, the small piece of plastic that slides to uncover the square hole in the upper-right corner of the disk.

Z80 device: A device containing a Z80 microprocessor. An Apple equipped with a Z80 card can run programs based on the popular **CP/M** operating system.

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